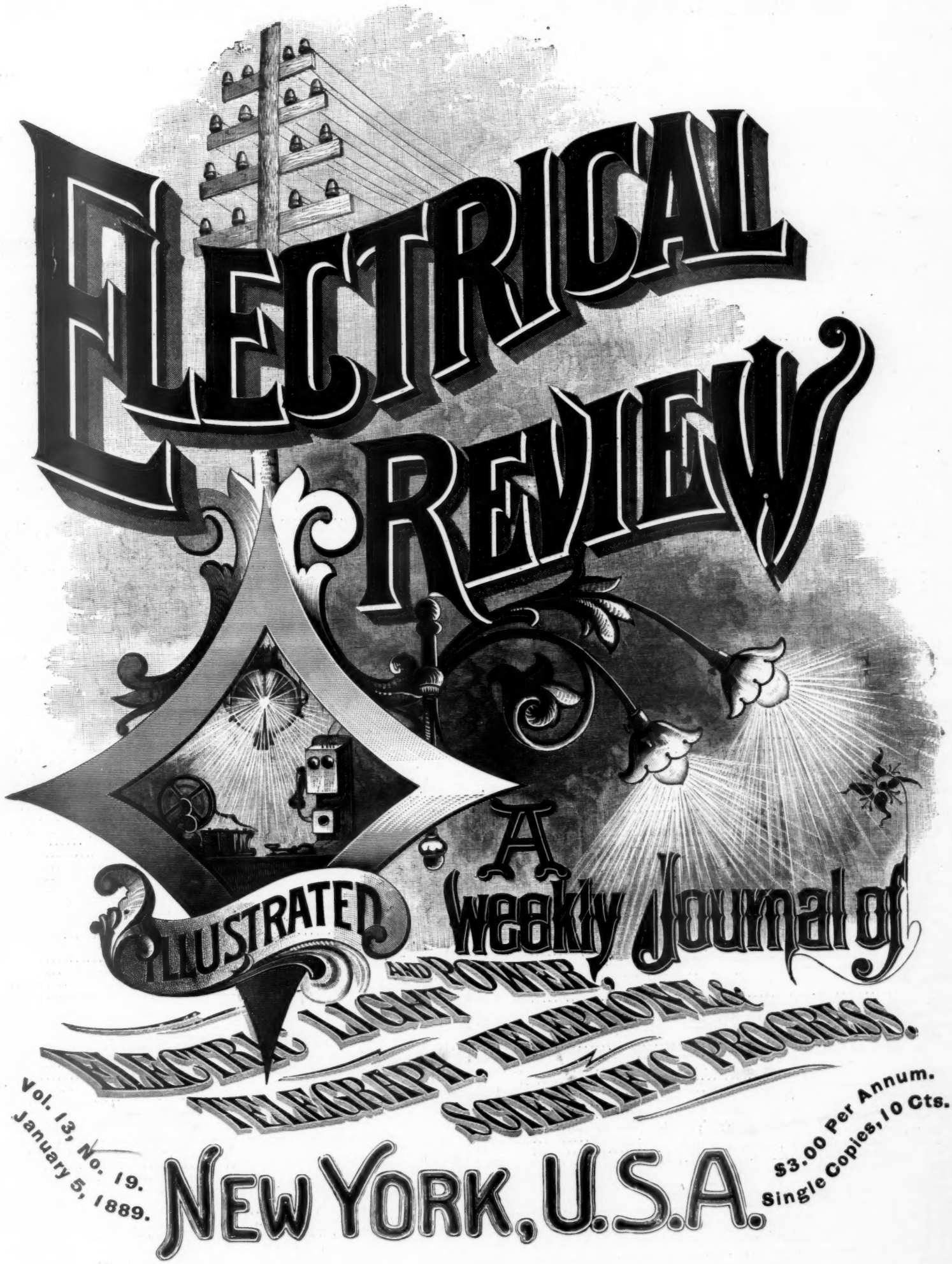

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Summary of the Great Progress Made During the Year Past in the Electrical Field.

The history of applied electricity during the past year has been comparable to that of a development rather than a germination. The improvements have been many and valuable, and they have tended towards completion of systems rather than isolated inventions which, standing apart from precedent, attract attention by their isolation.

The completeness with which the subject of electricity has been handled by the physicists and inventors, does not permit, at the present day, the importance of a great invention to appear as prominent as many inventions of lesser import have in former times been regarded, solely on account of the lack of nearly as brilliant an environment.

One marked indication of the year has been the financial solidity pertaining to electrical possessions. There has been less of the speculative element with its feverish fluctuations of prices, and there has been more of the actual increment of value, resulting from profits in the administration of affairs.

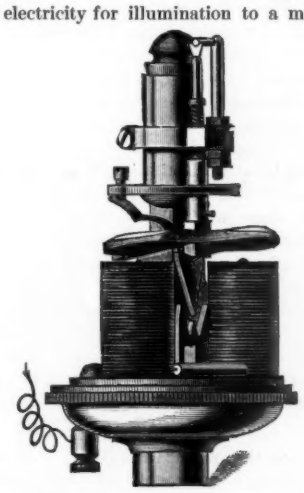
In calling attention to some of the most salient features of electrical interest during the events of the year, it must be conceded that the limits of this article will necessarily force an omission of even the slightest reference to much that possesses great importance both in regard to matters of scientific interest and commercial importance; while, on the other hand, affairs originating in previous years have only reached to conditions of importance within the time covered by the limits of this review.

ORGANIZATIONS.

The higher developments of civilization bring humanity into a closer bond with each other, and there is less isolation and a greater degree of co-operation among those of similar tastes and the same interests. The whole tendency of the age is towards organization and union of similar interests.

This has been clearly shown during the past year by the increase of activity given to the various organizations, especially those devoted to scientific and engineering purposes. The National Electric Light Association has held two successful meetings, one at Pittsburgh and one at New York, during the past year. At each of these, numbers of papers upon subjects relative to electric lighting, or other themes pertinent thereto, were presented and received intelligent discussion; bringing to persons interested in electric illumination a large fund of information, both in regard to facts adduced by precise observers and also the opinions of those of ripe experience, which have been, we venture to state, in no small degree an important element in the measure of increased prosperity of electric illuminating interests during the past year.

The questions of installation, application of power to the generation of electricity, underground wires, insurance, electric motors, the distribution of electricity by induction systems using alternating currents, are some of the themes which have been ably presented before this Association, in a manner which has advanced the application of electricity for illumination to a measure



NEW STYLE AUTOMATIC BURNER.—See description, page 2.

beyond what would be possible in the same time, had the world relied upon the old and time-honored methods of distribution by personal experience, books, or even communications by the technical press.

The Institute of Electrical Engineers has held its meetings in the hospitable quarters of the American Society of Civil Engineers, and the papers from the organization have been strictly technical, and afford valuable contributions to electrical science.

The Electric Club has more than completed its first half year in its new quarters and is a most prosperous organization. While affording the conditions of elegant hospitality, it also fulfills a far more serious purpose than that of clubs founded for merely social purposes. Persons of genial tastes agreeably meet each other within its rooms, while the papers at the monthly meetings in the electric hall have treated of a wide variety of electrical subjects in accordance with the policy of the Club, which is intended to be broader than that of any single portion of the great field of electricity.

The telephone conventions have been devoted to the consideration of matters connected with the electrical transmission of articulate speech, comprising alike scientific principles, questions of administration, and even the legal rights pertinent to the question.

The Edison Electric Illuminating Companies have held their conventions, which were devoted to the consideration of subjects directly pertinent to that subject.

Other organizations have given attention to electrical interests, lectures upon the subject having been given before the Franklin Institute of Pennsylvania, at Philadelphia. The Society of Arts, in Boston, had electrical lectures at several of their meetings during the year. Also, at the meeting of the American Association for the Advancement of Science, held at Cleveland in August, questions of electrical principles, and the results of experiments, were read in the section of physics.

All of the three great engineering societies have listened to papers from their members upon electrical subjects, which was an event of rare occurrence previous to this year. The Institute of Mining Engineers meeting in Boston in February, the American Society of Civil Engineers meeting at Milwaukee in July, and the American Society of Mechanical Engineers meeting at Scranton in October, all gave consideration to electrical questions.

The Society of Telegraph Engineers and Electricians has put forth many valuable papers covering a wide range of electrical subjects, as has been shown in the reports of their transactions in the foreign press, the most valuable of which have been reprinted by the ELECTRICAL REVIEW and our American contemporaries.

NEW AUTOMATIC BURNER.—See description, page 2.

ELECTRIC ILLUMINATION.

Electric lighting during the year has made desirable changes in financial solidity. It has been considered more as business of the conversion of the calorific energy of combustion into electrical energy, and by the economies involved has quickened many inventions tributary to this interest, especially those connected with the generation of steam and its conversion into power.

Electric lighting is becoming a more judicious investment of capital affording promises of remuneration comparable to those which have resulted from the gas interests. The illuminating gas companies have still further met the question of electric illumination in a broad and judicial spirit, recognizing the limits of its application in many places, where it has been more profitable to combine illumination by gas with that of electric lights, according to the particular conditions of each case.

The introduction of central stations has increased, until it is doubtful whether there is a city of 15,000 inhabitants east of the Mississippi which does not contain an electric lighting station. The value of such illumination, especially for public places, has been more generally recognized in cities where the number of lights and the time of service have been increased in obedience to a legitimate public demand.

Electric illumination has been increased in public buildings, not merely theaters, but also in prisons, reformatory institutions, hospitals and asylums, where the simultaneous application of this form of illumination has been of great importance; while the improved hygienic conditions from a method of illumination which can exist without altering the temperature or vitiating the condition of the air have undoubtedly been of the greatest importance to the physical condition of the inmates of such institutions.

Certain combinations on the part of the manufacturers of electric lighting systems have enabled some companies to manufacture a wider range of apparatus, and therewith increased their field of usefulness.

In England, electric lighting suffers from unfriendly legislation well calculated to repulse investments of capital, and the extension of electric lighting plants on the continent has been very considerably by those of American manufacture, the principal electric light companies in America having made an extensive out-put of plant for foreign consumption.

These commercial affairs have tended to confine the advance in electricity in England principally to theoretical matters; a large number of persons having been educated in the principles of electricity in the admirable institutions of England, who have performed a great deal of valuable work in the way of experimenting and investigation.

The objections alleged against aerial wires still continue, and New York is naturally looked to for the solution of the underground wire problem. But the progress thus far has been largely of a legislative nature, combined with a masterly inactivity in some quarters, so that the result has not been that progress which some advocates of underground conductors had anticipated.

MOTORS.

The advance in electric motors has been fully as marked as that of any other application of electricity, particularly in regard to street transit, where it has, during the summer and autumn months, stood the most severe tests in our northern cities. During the winter, if carried out to the full measure of success, the result will be its complete substitution, in many cities, for horses. In any event, it will undoubtedly be of permanent use when streets are not covered with snow.

Motors have been introduced to an extent far beyond what could have been anticipated, especially in connection with conductors from central stations, where electricity has been used for a great many small powers

near cities, especially in places where it filled the demand for motors in positions where other sources of power were not feasible.

In industrial establishments electric motors have been successful in connection with the elevators and tramways in mill store-houses. In mining, especially in the great mineral regions of the West, electric motors were successful in their applications to drilling, pumping, tramways and hoisting, utilizing for this purpose an amount of water-power hitherto unavailable, because situated in localities where there was no feasible method of its transmission to the mines, except by means of electricity.

The application of motors on street railways has stimulated a demand which has existed to some extent ever since the introduction of electric illumination; and that is a demand for watches which will not be injured by the powerful magnetic fields around electric light and power machinery. In addition to the admirable Swiss watches, containing movements made of alloys of palladium, and extensively sold in this country, the leading watchmakers in America are making watches with non-magnetic movements, and the introduction of electric machinery is becoming so general that the use of such watches must, in the nature of things, be a necessity not merely to those whose occupation is connected with electricity, but also to the general public; for it will be impossible for people to go around in the usual way without inadvertantly exposing their time-pieces to injury.

SECONDARY BATTERIES.

Secondary batteries have been widely used during the year in connection with illumination and also for furnishing the energy for motors on street cars; and they have shown results of a satisfactory nature far in advance of what could have been chronicled in previous years.

LAW.

The questions pertaining to electricity have been surrounded by litigation in the attempt to fix upon property rights as vested in patents. But the proverbially slow course of the law has resulted in some decisions of importance during the year.

On the 19th of March, the telephone patent of Alexander Graham Bell was sustained by the Supreme Court, and in November, the same court over-ruled the demurrer against Bell in a case affecting the patent. To a non-professional mind, the law's delays in these matters have been so extraordinary, that it appears doubtful if the case can be decided upon questions of law and fact until some years after the expiration of the original patent.

On the 14th of August, a United States Circuit Court made a decision sustaining the Thomson-Houston patent for regulating dynamos, a decision of some general interest as being the first electric lighting patent thus far sustained by the courts in this country.

There have been other decisions defining the scope of some patents pertaining to systems of electric distribution by induction, and also in connection with incandescent illumination, but no decision of importance as a finality has yet been given upon these subjects.

The revision of the United States Patent Law has been considered by the National Electric Light Association and others seeking for changes which would give to the United States patent system an exclusive use of the patent office building, at Washington, and allow an income and position to its officers comparable to those of judges in court; a special patent court also fixing upon questions of limitations and damages.

A bill looking towards the establishment of some of these features has received the indorsement of judges of the United States Supreme Court, and others high in authority upon matters connected with patents; but thus far nothing has been accomplished beyond developing a public sentiment in favor of a greater degree of justice towards the inventors of this country.

INSURANCE.

The interests of the underwriters, which are so widely spread as to pertain to all buildings, have been favorable to electric interests. The Electric Light Exchange, in Boston, whose board of examiners have examined and given licenses of various degrees to persons connected with the uses of electricity for illumination, has been a most wise and successful move, worthy of extension throughout the country, a matter which is clearly within the scope of the National Electric Light Association.

Some of the insurance rules during the year have been mended and amplified until they are now subject to the criticism of undue prolixity. It appears as if the insurance rules upon such a matter should seek to express a general policy, rather than to define methods with a strictness which renders them almost in the form of specifications, and yet without the lucidity necessary to permit the adoption of new and important forms of apparatus and methods of construction, whenever such improvements may be made.

In engineering construction and building, the party who draws the specifications is responsible for the satisfactory completion of the work, and the extension of insurance rules to a degree which renders them so near to specifications, is not accompanied by any element of responsibility or guarantee on the part of the representatives of the underwriters.

These rules were based upon those first made eight years ago, but some of them have been changed by various boards of underwriters, and often by persons not possessing either scientific knowledge or practical experience of the questions involved, until many elements of error which should be eliminated have been inserted into some of the rules, and many of them contain features contradictory to those of others, until insurance rules are almost as well defined for their localities as almanacs.

Electricity still plays an important part in protection against fire. Thermostats, in connection with automatic fire alarms, many of them of great ingenuity, have been widely introduced, especially on steamers of coast and inland navigation lines, hotels, and other public buildings. The ordinary fire-alarm systems have received a valuable alliance from the auxilliary fire alarms, which enable the nearest fire alarm box to be struck by means of electrical apparatus situated in buildings. Some forms of electrical apparatus, formerly dependent upon batteries, are now supplied by electricity from dynamos. For example, in various telegraph and stock telegraph offices, telephone stations, the one form of watchman's electric clock, instead of being dependent upon the battery, uses electricity generated by the magneto which is set in motion by the watchman in the act of turning a key at the several stations of his patrol in the ordinary manner.

THE TELEPHONE.

The telegraph and the telephone are the great communists of the age, bringing all to a common level in the knowledge of events which fix prices and direct affairs.

The day is past when a Rothschild by knowledge of a battle brought by special couriers, can make millions; or when a journalist like the elder Bennett can hold a preëminence by a system of mounted messengers.

Electricity is a messenger for all and its communism is one that raises and builds up for the prosperity of all, and working injury to none.

There is not, at this date, much of general interest to be presented in regard to telephone and telegraph interests The long distance telephone has grown into popular favor and proves of great use. The lines of this system connecting the main cities have been a most excellent work of engineering. This was fully tested by the blizzard of last March, so successfully resisted by these lines at a time when telegraph lines in all directions were disabled.

The telegraph interests have carried out their general policy of combination and extension. The annual reports will shortly give the logic of figures pertaining to these great corporations, which will also include those of the Trans-Atlantic cable.

ELECTRIC WELDING.

This great invention of Prof. Elihu Thomson is one of unusual interest, both for its practical importance and as forming a break in the long line of time-honored mechanical methods. Its ability to join in homogeneous union any metal or alloy, or, in fact, different metals or alloys, within certain limits of their respective fusion points, shows that the capacity of being welded, a physical feature possessed by few metals, as has always been assumed, is common to all. The erroneous conception has been due to the imperfection of process, and not due to physical peculiarities as assumed.

LIGHTNING.

In the study of lightning there has been a renewal of the interest of the early philosophers, whose study of electricity was naturally directed towards the great natural effects apparent through atmospheric electricity. The methods of investigation, it is true, have been far different, but only in the measure that the methods of scientific thought, and especially of apparatus, have been greatly modified since the days of Benjamin Franklin.

There will doubtless be much of interest accruing from the investigations of Dr. Moses Greeley Parker, (see ELECTRICAL REVIEW, November 24th, 1888) in studying the phenomena of lightning by means of instantaneous photography. This method, in the hands of a great number of observers, will undoubtedly accumulate facts sufficient to furnish the source of inductions of great value relative to atmospheric electricity.

EDUCATION.

The persons connected with the manufacture of electrical apparatus, have in no small degree been limited in past years, by the difficulty of obtaining assistants and investigators, equipped, and with the proper mental training to engage in such work to the best advantage. It is a matter of pride that the advance of facilities for study and electrical engineering has increased in the leading technical institutions in the country.

These "mills of the gods" are furnishing a grist whose work is of incalculable value in connection with the development of electrical science. Certain men of invention may be the result of luck, of long delving, or ingenious puzzle work; but the highest type of practical ability and economy in this subject can be reached only by the work of trained minds advancing in intelligent and systematic methods.

MISCELLANEOUS.

Among the general inventions of the year which have been brought into public notice to a degree worthy of at least passing mention, has been the improved phonograph of Edison, also the Taintor-Bell phonograph-graphaphone. Both of these instruments have succeeded in a most remarkable degree in the reproduction of sound, not being limited to the voice of a single person or the sound of one instrument, but reproducing as readily a chorus, an orchestra, or the hum and applause of an audience.

It has been lately reported that the reproduced conversation from a phonograph was offered as evidence in an English court.

Electricity has been used for the tempering of steel wires and watch springs, resulting in uniform work, satisfactory quality, and lower cost.

The production of aluminium alloys by means of very high temperatures furnished by the conversion of electricity into heat, has been extended during the year, and there have been reports of the production of aluminium by similar methods; but the use of ferro-aluminium for mixture in iron castings has been one of the most important advances of metallurgy during the year. The paper on this subject, read by W. J. Keep, C. E., before the American Association for the Advancement of Science last August, contains a full account of the results obtained, both in respect to the character of the castings and the increased strength of the metal.

In manufacturing, one of the new uses has been the production of copper tubing by electro deposition.

It will be impossible in the limits of this article, to refer even by name to the many and ingenious applications of electricity in various uses, such as typesetting, typewriters, and other devices and small machines.

The State Legislative Commission of 1886, reporting upon execution of criminals under capital sentence by electricity, has received a great deal of attention, and the results of further investigations upon the subject have been given to the public. The results of this method of punishment in respect to the establishment of law and order, are as yet unknown.

Capital punishment differs from other means of punishment largely in its exclusive appeal to the sentiments of others. A criminal sentenced for life is practically as incapable of further harm as though he had been executed. Yet there does not seem to be the same dread of results from pre-determined homicide in States where capital punishment is abolished, as in those where hanging is in vogue.

We do not propose to digress from the functions of the paper to discuss the question of capital punisment, except so far as electrical interests are involved; but we have yet to learn whether those criminally inclined will be more fully restrained by prospect of death by electricity than by hanging.

It is conceded that death by electricity is a painless method of destroying life. Many years ago a duel was fought in this country as the result of a discussion as to whether a Spanish or a Bowie knife was the most destructive, each participant being armed with his favorite weapon. Much in the same line has been the recent challenge, in which the challenging party proposes to use a direct current, and the challenged an alternating current.

It appears as if it would be much more in the line of a duel if the two parties were to pledge themselves to touch the electros without knowing which current they were to receive, like the duel of the apothecary during the last generation, who presented two pills to his antagonist, one of which was deadly poison, and the other harmless. He pledged himself that when his adversary had selected one, he would join him in eating the other.

The electric interests being the largest consumers of copper, are naturally identified with events connected with the supply of that metal.

The *Société des Méteaux*, generally referred to as the French Syndicate, made contracts for the supply of the principal copper mines of the world, generally for a three year's contract, expiring December 31, 1890. This vast purchase of about 186,000 tons per annum, involving a yearly liability of nearly $60,000,000 has been successfully conducted, and it is declared that the scheme has been highly profitable to the projectors.

Electricity has been so widely used in its various applications, that it has become a part of every life, an element in every business transaction, in our methods of education through the daily press, adding to the measure of our enjoyment, happiness, and capacity for existence. What the measure of after inventions will be, none can tell; but one does not hazard anything in expressing the assurance that there will be a still more universal use of electricity during the year 1889.

A New Automatic Burner.

Since the first successful attempt to construct an automatic burner, whereby gas could be lighted and extinguished by pressing buttons placed at a distance from the burner, notable improvements have been made from time to time. It was at first thought that two separate circuits were required, one to cause a movement of the gas-valve turning the gas, and the other to pass through an induction coil and so provide a spark for lighting. The discovery that placing in the circuit a spark coil, consisting of copper wire with iron core, in no way interfered with the action of the magnet operating the valve, and at the same time produced at the circuit breaker, at the tip of the burner, a spark sufficient to light the gas, so simplified the apparatus that its introduction has finally become very general.

The Electric Gas Lighting Company, of Boston, have spared neither pains nor expense in perfecting their goods, and have put upon the market several most excellent and practical styles of burners. One, the "Single Magnet" Ratchet Automatic No. 4, has been a standard for years. They have recently produced the "Triumph" Automatic Burner, No. 12, which will attract attention by its strikingly novel features, and is sure to become a general favorite on account of its small size, simplicity of design and excellence of workmanship. A single electro-magnet, when

the circuit is closed through it, attracts an armature of annealed Norway iron, which is normally held up by an adjustable spring. The armature projects into a slot in a vertical bar of rectangular shape. On this square rod is pivoted a lever, the upper part of which engages with a V-shaped projection on the pillar. Two springs, extending from the base of the bar upward, keep the lever in its proper position. The cam, which oscillates the valve, has two V-shaped recesses, one slightly deeper than the other, in either of which the lower end of the lever, also V-shaped, engages.

Let us suppose the armature to be attracted and the lower end of the lever to enter the deeper recess, the cam is thrown over, opens the gas-valve, and the bar carrying the lever as it descends, engages a projection in the electrode-rod and thereby breaks the circuit at the burner tip, causing a spark which lights the gas. The moment the armature is released and lifted by its spring it raises the bar, and the electrode-rod again closes the circuit, which is alternately broken and closed as long as the current passes to the burner. If the circuit to the burner be broken at the press-button, the armature rises to its normal position with the lever, which then engages the V-shaped projection in the pillar. The cam, in operating the valve, has swung past the center, and its shallower recess is now directly under the lower end of the lever. By closing the circuit the armature is again attracted, but the lever moved by it cannot descend in this recess so far as to move the electrode-rod, consequently the circuit is not broken at the tip of the burner, while the cam is thrown in the opposite direction to that which opened the valve, therefore closing it and extinguishing the gas.

It will be seen that only one wire and a single press-button are required to light and extinguish this burner, and that only half as many wires are required for this as for other styles of automatics. Fixtures wired for Pendent burners may be supplied with the "Triumph" automatic by connecting in a press-button between the battery and burner. The use of a single press-button offers many advantages. The small size and symmetrical shape of the burner renders it an ornament to the most elaborate fixtures. Its wonderful simplicity ensures perfect action under all conditions, and renders it less expensive than more complicated styles. All of which will make it a favorite with the trade and public. Only the best materials are employed in its manufacture, while skilled workmen with accurate tools have, under expert supervision, produced a quality of work that will attract the attention of the most critical.

The Electric Gas Lighting Company is to be congratulated on the enthusiastic reception that is being accorded to this wonderful product of electrical and mechanical skill.

The Danville Electric Railway.

The president and directors of the Danville Street Car Company, having operated a street car line for about one year with mule power, came to the conclusion that unless some more economical method could be introduced the venture would not prove one of much financial profit. They had seven cars of the pattern known as "Bobtail," which were drawn by mules and operated by one man.

The grades of their road were heavy and very long, and the result of these was soon apparent in the cost of maintaining the mules, and in the small receipts which slow speed could only return. The people either would not, or did not care to patronize a car toiling along at a two mile pace when they could walk at a rate nearly double what the car was making. To therefore give the public better service by increased speed and carrying capacity of the cars, and to reduce the time intervals, some different method of car propulsion was investigated. Realizing that electricity was playing an important part in this direction, they proceeded to look into it. After examining all systems and visiting electric roads in their own State, and having bids submitted by the different electric railway companies, they came to the conclusion that the Thomson-Houston system was the most substantial, durable cand economical. A contract was therefore given that company and work was soon commenced. The entire length of the road is a little over two miles, and for 4,150 feet of this distance the ascent averages 4.3 per cent.; for 2,100 feet of this the ascent averages 5 per cent.; for 1,000 feet the ascent is 7 per cent.; and for a short distance of this 1,000 feet stretch the grade exceeds seven and a half per cent.

Up these grades, which the electric car surmounts with ease, it was with difficulty that four mules could haul an ordinary load at a very slow speed. There are three diamond pointed turnouts with the necessary overhead frogs owing to the fact that the track is single the entire length.

One noticeable feature which this road brings out, is that it is perfectly practicable to have a car operated by one man, even though there are a number of switches in the line. It is not in every case the wisest or best plan to pursue, but in some localities it may be the only one possible. It is a noteworthy fact that a man easily handles a car, and this is due to the admirable perfection to which the overhead switches and the trolley wheel have been carried out. No trouble whatever is experienced, although the driver rarely gives the overhead matters any attention.

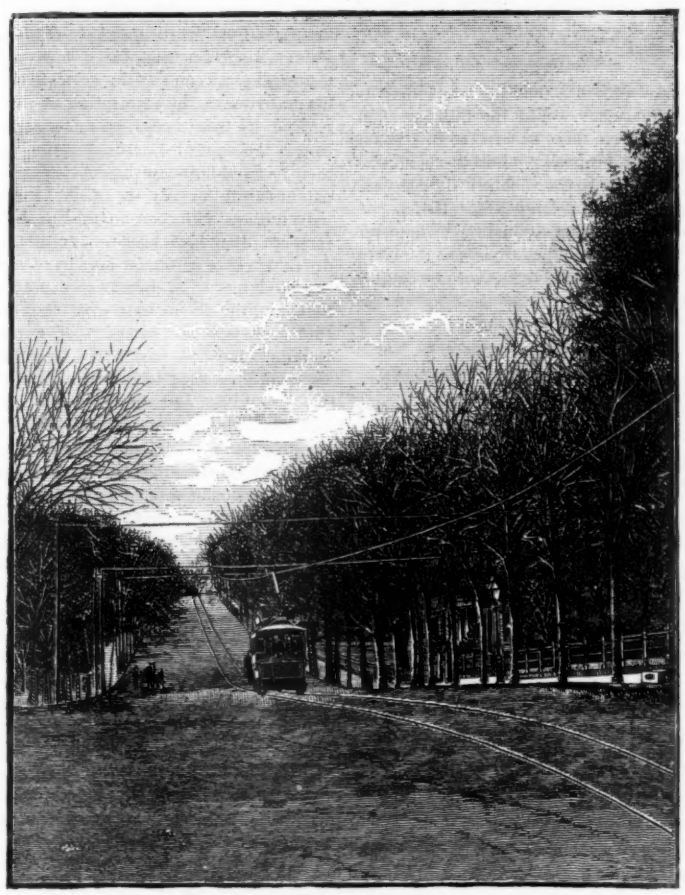
The cars were equipped with motor trucks of 10 horse-power capacity, the controlling mechanism being concentrated at one end. The overhead system was built in the most thorough and substantial manner, and according to the well known admirable plan of the Thomson-Houston Electric Company.

The road was started in operation on the 20th of November. Four cars are daily run on a scheduled basis which reduces their former mule schedule nearly 25 per cent.

Since the road was started scarcely any electrical trouble has been experienced, and it has been the universal comment of the residents of Danville that their railway company has materially added to their welfare and comfort, and that they could not have selected a system which would have worked to any better satisfaction than the Thomson-Houston.

Considerable extensions are contemplated on this line in the spring, and other cars will, in all probability, be added.

The power station is located on the opposide of the Dan river, some 2,000 feet away from the line. The generator is of 80 horse-power capacity, and is driven by a 75 horse-power water-wheel.



THE DANVILLE ELECTRIC RAILWAY.

New Sprague Road in Chattanooga, Tenn.

Since the last issue of this paper the Sprague Electric Railway and Motor Company, of New York, have closed another contract for electrical equipment in street railway work. This is with President Charles A. Leyerly of the Chattanooga Electric Street Railway Company, and calls for the entire equipment of this electric road.

The Electric Street Railway Company at Chattanooga has been only recently organized, and the construction of their road will be new throughout. The line will extend over five miles of track, and there are a number of sharp grades which will have to be surmounted by the Sprague cars. The system used will be the regular Sprague overhead, with small silicon bronze overhead wire for a working conductor.

The contract awarded to the Sprague Company includes generators and all electrical apparatus complete.

Eau Claire, Wis.—Articles of association have been filed in the secretary of state's office by the State Manufacturing Company, of Eau Claire, with a capital of $15,000. The incorporators are E. J. Pope, Elmer Pope and W. H. Hayden.

Chicago, Ill.—Colby Hardware and Electric Company, of Chicago; capital, $50,000; incorporators, F. K. Biggs, Charles Loughbridge and H. L. Forbes.

Chicago, Ill.—Chicago Car Brake Company; capital $200,000; to manufacture attachments; incorporators, J. N. Young, G. B. Quigg and Edward Lewis.

Chicago, Ill.—The Union Light and Fuel Gas Company of America, Chicago; capital $5,000,000, for acquiring concessions from the governments of Mexico and the United States for the manufacture of fuel and illuminating gas. Incorporators, Charles J. Wimple, N. A. Havens, Andrew J, Park. Wimple subscribed for all the capital stock except $1,900, which was taken by F. M. Charlton, Thomas D. Dewey, Nathaniel A. Haven, W. B. McCreery, Daniel L. Davis, John W. Dewey, Samuel A. Gaylord, Woodbury M. Taylor, John H. Hardy, Andrew J. Park, John D. Norton and A. T. Nichols. This is the company which has just obtained concessions from Mexico for the gas business.

Salisburg, Pa.—The Salisburg Gas Company of Indiana county; capital stock, $50,000.

Philadelphia, Pa.—The Illuminating Fuel and Gas Company of Philadelphia; capital stock, $1,000,000.

Oshkosh, Wis.—The Oshkosh Edison Electric Light Company has been incorporated with a capital stock of $10,000.

Taylorville, Pa.—Taylorville Electric Light, Heat and Power Company, of Taylorville, Lycoming county; capital, $160,000.

Chicago, Ill.—Monitor Company of Chicago; capital, $35,000; to deal in patents; incorporators, L. M. Ennis, R. P. Bates and J. W. Sutton.

Chicago, Ill.—Chicago Condensed Fuel Company, of Chicago; capital, $20,000; incorporators, A. R. Davis, A. K. Murray and A. M. Kinkaid.

Chicago, Ill.—Matthews Gas Machine Company; capital, $50,000; incorporators, Charles Matthews, Lewis Matthews and Charles Matthews, Jr.

Toronto, Can.—The Toronto Incandescent Electric Lighting Company, with a capital of $200,000. H. S. Howland, W. R. Brock, R. Jaffray and others, are the directors.

Chicago, Ill.—The Northwestern Rubber Company of Chicago; capital stock, $100,000; incorporators, Richard T. Whelpley, Edgar Whitehead, and William W. Gurley.

Chicago, Ill.—National Railway Company of Chicago; capital, $1,500,000; to construct horse and dummy roads; incorporators, Monroe L. Willard, William M. Brinkman and Arthur A. Bliss.

Newark, N. J.—The Rochester Lamp Company. The capital stock is $100,000. The incorporators are Charles T. and Ruby F. Upton, of New York, and Matthew W. Hawes, of Rutherford, N. J.

Newark, N. J.—The C. T. Williamson Wire Novelty Company, of Newark. The capital stock is $50,000; incorporators, Cornelius T. Williamson, Wm. A. Williamson and Frederick G. Williamson.

Bakersfield, Cal.—The Bakersfield Electric Light Company has organized with L. P. St. Clair, president, O. D. Mattson, secretary, and M. G. Elmore, superintendent. All the stock, $20,000, has been subscribed.

Washington, Pa.—The Washington Electric Light and Power Company, H. P. Chambers, president. It will be operated in connection with the works of the Washington Carbon Company, and the system the Westinghouse.

Chicago, Ill.—Perkins Lamp and Electrical Supply Company, of Chicago; capital, $250,000; to manufacture incandescent lamps, supplies and machinery; incorporators, W. G. Halm, J. H. Ward and M. C. Neuberger.

Troy, N. Y.—The Troy Public Works Company, limited, capital stock of $20,000. The incorporators are Richard W. Sherman, Martin B. Delong, Sanford T. Sherman, Henry J. Cookingham, of Utica, and Michael McDonough, of West Troy.

Detroit, Mich.—The Detriot Galvanizing and Tinning Works will engage in galvanizing, tinning, and the manufacture of Leadley's patent conductor pipe and hook. Capital stock, $50,000. George L. Smith and James F. McGregor ho'd 660 shares each and Frank G. Smith, Sr., and Frank G. Smith, Jr., 340 shares each.

Denver, Col.—The Denver Clear Creek and Western Railroad Company. The incorporators are S. T. Smith, Walter S. Cheesman, J. W. Gillsley, W. H, Griffith and H. P. Parmalee. The terms of existence of this company is to be for fifty years, and the capital stock of the company is $500,000, shares at the par value of $100 per share.

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We invite correspondence from Electricians, Inventors, and the Telegragh and Telephone fraternity and those engaged in Electric Lighting, on matters pertaining to electrical and scientific subjects, and all facts of special interest in connection therewith.

We extend to manufacturers of electrical apparatus an invitation to send to this office any and all facts concerning their business which will be of interest to the public. We make no charge for publishing news.

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NEW YORK, JAN. 5, 1889.

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The Chicago convention of the National Electric Light Association may be expected to be the largest gathering of electrical people ever held. The Eastern members will turn out in force, and it is expected that the rapidly developing West will be more numerously represented than ever before.

We invite the attention of every REVIEW reader to our editorial resumé of electrical advancement for the year 1888, published on pages 1 and 2.

If Mr. Gerry's society is really anxious to torture the condemned, he should get a bill passed authorizing a dose of rat poison or forcing them to read the annual reports of the Society for the Suppression of Vice. Electricity is not suited for such work!

In the famous game of Electricity *vs.* Boodle, electricity seems to have won! And if it is true that the Fourth avenue surface line, of New York city, got their permit without pain (also spelt payin'), the fact, if fact it is, will attract more general attention than the motors themselves, being, as one might say, even more novel than they.

Isolated electric lighting for country houses is in great demand just now when it is getting to be fairly well understood that electricity doesn't *explode*. In England, where there are so many "seats," practically castles, the thing is easily done; a small station is built for dynamos and steam engine, but in the average country house here, far away from a central station, we incline to the belief that secondary batteries will be used.

The law provides that the wires shall be buried, but what would the Subway Commission do were there no wires at all? Here's M. Tabourin proposing to the Paris municipal council to place a minature dynamo and gas engine in every lamp-post. He has constructed a gas engine 10 inches in diameter, to be fed from the pipes already in the lamp-posts, and a minature dynamo to be coupled up with it, the result being a voltaic arc light atop instead of a gas lamp.

A PLEA FOR OUR INVENTORS.

Ever since that immortal day, over a century ago, when the song of liberty echoed through the land, the United States has pushed steadily forward, and has for years stood among the first of nations. The last quarter century has seen no retrogression, but rather, the most wonderful advance, until to-day we are the most independent and self-sustaining nation on the globe, and, we believe it may be added, the most prosperous. And yet it is none the less true that in one respect there is not a nation to-day so niggardly, so contemptibly mean, miserly and short-sighted, as the Government of the United States. That is in respect to what has been not alone the bone and sinew, but the sustenance of its wonderful growth, the heart of our magnificent life—invention. But as there can be no invention without an object, and that object always has taken the shape of a reward, our erstwhile sagacious law-makers years ago saw the advantage of legalizing the reward by bestowing upon the inventor, who is nothing if not a benefactor, a deed conveying to him the exclusive right to the child of his brain for a set term of years. And the United States statutes have no brighter spot than the section relating to patents. But the carrying of that section into effect is nothing short of a blot upon the fair pages of our history.

Taxpayers in this country pay for the protection and guarantee of certain rights, and if these rights are infringed by ever so little, a tremendous row is raised by the sufferers, and their clamors are unceasing until justice is obtained. It is their right. Inventors are as truly taxpayers as any other citizens. They pour their gold into the common treasury as the guerdon of protection, and have a right to the constitutional return. Let a rich taxpayer have a bad piece of paving in front of his property, and complain in due form to the proper authority; will he be months, nay, years, getting redress? Let him own a bit of land, and some outlaw squat on it at his door; does the law keep him usually from instant redress? Hardly; recourse is swift and sure. Yet, an inventor becomes the recipient of a deed from the Government, and if the deed covers a choice bit, a really valuable invention which in time may add millions to the wealth and resources of the nation, the poor fellow generally has to spend a fortune to protect his little all from the cormorants, who plead his title defective.

For years and years the Commissioner of Patents has begged and implored Congress to give the the vast army of inventors the pabulum they need, has shown vast sums of money paid into the Treasury by inventors and, with a few slight exceptions, has for his pains been laughed at by Congress. He has asked for appropriations to place the department of patents on a decent footing, and has practically been booted out of the capitol! Shame upon such injustice, such shortsightedness, such ignorance of the real elements of welfare of this blessed country. A surplus measured by the hundred million of dollars annually storing up in our treasury; millions for post-offices every year, millions for purely local river and harbor improvements, millions for pensions, millions for subsidies, millions for guarantees, millions for the Indians, millions for the army and navy; and yet when the Commissioner of Patents modestly asks for a few hundred thousand extra to meet the growing needs of his department, the mainspring of our prosperity, a few congressional iconoclasts utterly ignorant of the true situation leap to their feet and harangue against patentees and patents until the very air of the legislative halls quivers with their anathemas, because, forsooth, they have been sent from farming districts where a few farmers have not had wit enough to tell a deed from a promissory note, and the iconoclasts' eyes start out of their sockets at the prospect of a political lashing if the bill pass. No wonder the question is referred to committee and buried out of sight in depths dug by its sagacity. But it is none the less a shame, a shame upon the grandest government on the earth, and a shame which reflects sadly upon the intelligence and business sagacity of our national legislators. Our inventors are an army They do not ask favors, they do not knock for alms at the doors of the national treasury; but they demand justice, and year after year they are driven out to care for themselves.

There is now before Congress a bill for the establishment of a Patent Court, which is one of the most meritorious measures presented in years, and has the endorsement of the members of the United States Supreme Court, and we ask all members of both houses of Congress to make themselves acquainted with the spirit and intent of the bill, and doing so, their conclusion can but be in favor of the bill.

Another matter for Congress to act upon is ably set forth in the communication on the "International Union for the Protection of Industrial Property" in this issue from "American Inventor," which we most heartily commend to our readers and our law makers.

What a glorious opportunity exists to-day for some one of our national legislators to render himself famous and halo his name with the gratitude of the long-suffering, patient legion of inventors! Is there one in the halls of Congress who has come up from the ranks; one who has been an inventor and tasted the gall and wormwood of weariness which is to-day the average inventor's lot? If there is, and there must be, then let him raise his voice. Let him study the subject *thoroughly*, let him be the first to really make the question intelligible to his colleagues, let him show them that here is a damnable blot upon our fair fame, an incubus on our manufacturers and industrial artizans, and a crying injustice to our army of inventors. Let him pass a bill which shall place our Patent Office once for all on the footing it merits. Give it the funds it earns, and more if necessary; establish the Patent Court, and effectuate the real purposes of the International Union; and such member will have earned more glory than has fallen to the lot of a member of Congress for a quarter of a century.

THE BELL COMPANY'S TREATMENT OF INFRINGERS.

Every now and again we hear of a case where the Bell Telephone Company pays to some corporation, which has been doing a telephone business in some city or other, a sum of money when taking possession of the property which the courts have turned over to the aggrieved party on account of invaded rights; and somebody says: "Now, if the Bell Company has such a perfect monopoly of this telephone business, what in the nation is the reason it should give these fellows anything? I tell you the Bell Company don't feel so strong after all."

Did any one ever hear of the Bell Company paying for the telephones that Incendiary Frank Knight burns? No. The company has no patent on either franchise, poles, wires, or insulators. It has no patent right to the good will of the citizens who have been innocently drawn into the meshes of law which have entangled them. It says to the good people of the city of Tookemin, we have come to stay with you, and we only ask a fair showing. As an opposition you fought us and were whipped, but that only means the instruments. We will buy your property so far as it is available, and re-stock the exchange so that we can go on with the business.

The real truth is that this great, grasping monopoly, as it has been termed, has really been far more lenient and generous than just with many of its enemies, and by a very long chalk much, much more kindly in its treatment of those who have kept it in litigation from the commencement than would have been accorded to it had the various suits gone the other way.

OUR BOSTON LETTER.

(Special Correspondence.)

The Allston power station of the West End Street Railway deserves more than the passing mention accorded it last week. The building, which was constructed entire by the Jarvis Engineering Company of this city, is 92 feet long by 36 feet wide, and built in the most substantial manner of brick with hard pine timbers. The western extremity is the boiler room, whose height is 20 feet, with the cupola extending still higher, and affording excellent light and ventilation. In this room are placed three large tubular boilers made by Messrs. Hodge & Company, of East Boston, and each of 150 horse-power capacity. They are set in the Jarvis furnaces with Sheffield grate bars, and a special feature is the substitution of fire brick mouth pieces in place of those of iron formerly employed. This is an important advantage and one in which the Jarvis Company, being its originators, naturally take great pride. A National feed water heater of 500 horse-power capacity is employed, and a Davidson pump supplies the boilers. Damper regulation is effected by the Spencer automatic regulator, and a Hancock inspirator has been installed. The furnaces and boilers are very tastefully set, and, with the neat lettering put on by the Jarvis Company, form an ornamental feature of the whole station.

A large flue leads from over the boilers to the brick circular chimney, which is 100 feet high. Its core enlarges toward the top, being six feet two inches in diameter at the bottom and six feet eight inches in diameter at the top. Its outside dimensions are thirteen feet four inches at the bottom and seven feet nine inches at the top. In the rear of the boilers are conveniently placed doors in the brick work, allowing easy access to the flame bed and to the tubes. At the time of my visit the boilers had been run about four weeks without any signs of cracks in the masonry, a good test of the construction work put in.

The engine room is 50 feet long, and in it are placed the two 200 horse-power Armington & Sims engines, which are the largest made. They run at 200 revolutions per minute, and are connected with the dynamos by long lengths of belting 15½ inches wide. The favorite electric belting made by Schieren & Co., is used. The engine flywheels are 86 inches, and the dynamo pul-

ley 26 inches, in diameter. The fly-wheels weigh somewhere about 4,500 pounds each. The exhaust steam heats the car house adjoining. The plant was started the 1st of September, and considering the unusually bad weather, has been completed in remarkably short time. The entire building was built, and the steam plant complete furnished by the Jarvis Engineering Company, under the immediate supervision of Mr. K. M. Jarvis, assisted by Mr. E. S. Cobb, a most efficient foreman, and the whole work deserves the praise which has been so freely given it.

Through the kindness of Messrs. Sawyer and Blake, the New England managers of the Sprague Company, and Mr. William D. McQuesten, the contractor for the electrical plant construction, your representative was lately given an opportunity for a most careful examination of the details of both the station and outside work. The arrangement of switches in the station is such that any one or more of the four dynamos can be connected with either the underground or overhead portion of the line, thus making each entirely independent of the operation of the other. Many problems arose in dealing with the current there employed of high voltage combined with large quantity, but they have been met and worked out with signal success. Special precautions have been taken to protect the instruments and apparatus from lightning, and lightning arresters have been so placed as to ground any atmospheric discharges. The large switchboard on which are placed instruments for a complete control of the entire conduit and overhead systems, is a very ornamental, as well as distinctly useful feature, and will well repay a visit to the station for an examination of it.

Mr. Louis J. Magee, lately with the Thomson-Houston International Company, leaves on Sunday for Europe, where he will assume temporary charge of the European office of the Thomson-Houston Company at Hamburg. T. W. S.

Boston, Dec. 29, 1888.

OUR CHICAGO LETTER.

(Special Correspondence.)

Friday morning came the decision of the Supreme Court of Missouri, that the ordinance passed by the St. Louis Council was illegal, the city having no authority to regulate rates. The decision is in conflict with that in the Indiana cases where $36 was fixed as the maximum rate. Attorney F. S. Winston, who has been conducting negotiations between the contending parties thinks, the decision will have the effect of placing the ordinance for which he has been all along striving, in a clear light before the aldermen. He thinks the decision will simplify matters. "It is strictly in accordance with Judge Green's opinions," he says, "and substantiates our claims, that the city cannot regulate telephone rates."

December 4th, agreeable to notices issued by the City Inspector, a conference on the subject of insulation was held at the Electric Club's rooms, at which there were present C. C. Haskins; F. B. Badt, of the Western Electric Co.; E. S. Hewson of the U. S. Co.; C. H. Wilmerding, A. Lt. and Power; H. Ward Leonard, of Leonard & Izard; F. Sargent, Edison Co.; Geo. Cutter, Thomson-Houston; B. E. Sunny, of the same company, and of the A. L. & P. Co., as well, D. P. Perry, E. A. Sperry, of the Sperry Co.; G. A. Mayo, of the Van der Poele, and W. L. Abbott, of the National Construction Company.

Mr. Haskins was made chairman, and Mr. Sperry appointed secretary. The chairman stated the object of the meeting, when Mr. Leonard made a few remarks introducing a formula for determining the insulation required for a given plant. The following is the formula, in which insulation from ground in ohms equals the e.m.f. multiplied by a constant—in this case 10,000—and divided by the current in amperes:

$$\text{Ins.} = \frac{E + 10{,}000}{C.}$$

Much discussion ensued, in the course of which it was shown that a very steep insulation up-grade was prepared for the arc light fellows, while a corresponding decrease of insulation would be the result of additions to a constant potential circuit. Unit length of conductor for arc lights was considered. Mr. Haskins stated that the inspector was compelled to look after two elements in the case. In arc circuits he was afraid of the "V," while in the incandescent forms he was obliged to look closely after the "C."

The chairman asked an expression of opinion from the gentlemen present on the forms of line insulation in common use, condemning in strong terms the use of the underwriters' wire.

A general discussion followed, in which Messrs. Badt, Sunny, Cutter, Leonard, Sperry, and Haskins took part. Several substitute wires were endorsed by the gentlemen present, and on motion of Sargent, seconded by Badt, the following was unanimously adopted, as the sense of the meeting:

"That the underwriters' insulation should be entirely discontinued in the city of Chicago for use in the distribution of electric currents for arc and incandescent lighting, and electric motors."

The meeting adjourned, and at the adjourned meeting on Monday evening, a motion by Cutter, seconded by Sunny, was adopted, and the whole matter was referred to the Club for discussion, except so far as the underwriter wire is concerned.

The meeting of the Club was called to order immediately on adjournment by vice-president Sunny, and the previous proceedings briefly outlined by Mr. Sunny were followed by the reading of the minutes of the conference by secretary Sperry.

After a very interesting paper by Dr. G. W. Whitefield, the question of insulation requirements for electric wires was made the subject of discussion at the next meeting, January 7th, and the Club adjourned to that date. C. C. H.

Chicago, December 28, 1888.

OUR PHILADELPHIA LETTER.

(Special Correspondence.)

Considerable interest has been evinced in this State recently, over a discussion as to the legality of the charters of all electric light companies incorporated under the laws of Pennsylvania. The General Corporation Act of 1874 states the objects for which bodies may be incorporated, and summarizes them under various heads such as insurance, gas, water, iron, telegraph and railroad companies, but inasmuch as at the date of the Act, telephone, electric light and natural gas companies were not thought of, the question has arisen whether such corporations can be legally chartered under the laws of the Commonwealth. The natural gas interests recognized the difficulty under which they labored, and in 1885, secured the passage of an act to provide for their incorporation and regulation, and it will be to the advantage of electric light and telephone companies to provide for a similar outcome of their difficulties upon the assembling of the legislature next month. Touching upon this question, Samuel B. Huey, counsel for the Edison Electric Light Company of this city, and one of the celebrated corporation lawyers of Philadelphia, said last week: "This is the first intimation I have had that the charters of the several electric light companies are not regular and warranted by the general law of 1874, nor have I ever entertained the idea that they were not. I shall certainly look into the matter at once. The attorney general and secretary of state have surely always entertained the opinion that they were, or the charters would not have been granted. In case it should turn out to be the fact however, the legislature would not hesitate to act fairly in the matter and pass such retroactive legislation as would confirm the several companies in their rights, as they have been acting in perfect good faith under charters bearing the seal of the Commonwealth."

The government's new gunboat, the Yorktown, built in this city, has just been subjected to her trial trip on the Delaware, and is practically complete so far as her builders are concerned, and there remains but to put in her electric light engines and dynamos. Of these there will be two engines and four dynamos of the Edison type, for the general illumination of the vessel, but the government will subsequently install another plant to supply the search light equipment.

C. A. Bragg, of the United States system, has completed a contract with the Manufacturers Club of this city for a complete installation of an electric lighting plant for its new and beautiful house on Walnut street, above Broad.

M. R. Muckle, Jr., & Co., report the sale of the following Westinghouse compound engines in this vicinity lately: to the Pencoyd Iron Works, one 65 horse power and one 100 horse power; to the Baldwin Locomotive Works, one 100 horse power; to the Edgemoor Iron Works, one 200 horse power, and to William Sellers & Co., one 100 horse power. S. H.

Philadelphia, December 29th 1888.

A Hint to Congress.

TO THE EDITOR OF ELECTRICAL REVIEW:

I wish to call the attention of your readers to a very important matter that affects every inventor of this country, and that is, immediate necessity of Congress to provide able and ample representation of the American Inventors interests at the coming convention of the "International Union for the Protection of Industrial Property," to be held at Madrid in 1889. The importance of this Union to the interests of the United States inventors cannot be overestimated. So far, the aims and possible good have not been understood in this country.

This Union is destined to have a great influence in shaping the different and somewhat obnoxious patent systems of members of this Union into one uniform system, so that eventually one uniform term of years, one uniform cost, one uniform set of rules will govern every member of this Union.

Right here we come to the vital point of this matter, where the United States can exert an influence to get the foreign members of the Union to fashion adopted systems of the Union after the spirit of the United States patent law. It is admitted we have the best and most liberal patent system in the world, and that we would like Europe to pattern after us. In no way can we reach the matter as well as at this International Union. If the Union becomes liberal in spirit and adopts American ideas, Europe will become as good a field to the American inventor as the United States is to-day.

Then to influence this "International Union for the Protection of Industrial Property," it is necessary for the United States inventors to have skillful, able and learned representatives at all the future conventions of the Union. The representation should be especially familiar with patent law and skilful in diplomacy, so as to be able to cope with any member of the Union. England realized the importance so much that she sent the executive head of her Great Seal Patent Office and *two experts* to look after her interests at the last conference.

As examiner F. A. Seeley's report published under the direction of the patent office in 1887 says: Congress must provide for defraying the share of the United States in maintaining the International Union. * * Heretofore our ministers at Paris, Brussels and Rome have been delegated to represent this government. In future, if we are to remain in the Union, it is of the first importance that delegates *familiar with our patent* system, and *capable* of representing both the patent office and interests of *American inventors* and *manufacturers*, should be selected for that duty, and adequate means provided for their compensation and expenses. I would recommend every reader to inform himself by asking the patent office for a copy of F. A. Seeley's report on this subject.

At the last conference a discussion arose that was vital to the interests of the inventors and manufacturers of the United States, and our needs and interests suffered because of incompetent representation at the conference. Before Article 4 of the Union was adopted, the absence of the right kind of American representation was sadly evident. The whole importance of the Union lay *in this Article* 4, yet *American* interests were ignored, and ignorance was shown of the patent system of the United States and necessities of United States inventors that was not creditable to the intelligence of the conference. Article 4 allows any inventor of the country that is a member of the Union six months perfect control in which to apply for his patent in ALL THE OTHER COUNTRIES OF THE UNION, not six months from date of the day the inventor receives the patent or is granted the patent, but six months FROM THE DAY OF APPLICATION. Now, most American patents are not allowed in six months, most of them take a year's time, and some are not allowed before the end of two years. The European countries do not go through rigid examinations, therefore three months is their average in granting patents. No one can fail to see that this Article 4 fits the case of the foreign member but not the United States. It gives the foreign members of the Union plenty of time but does the United States no good whatever. What the United States inventor needs is to ask the Union at the coming conference that Article 4 be amended, so as to allow any member of the Union TWO YEARS ABSOLUTE *protection from* DATE OF THE DAY OF *grant* OF THE PATENT, not day of application.

To get this concession at the hands of the coming convention it is essential that Congress provide the desirable representation, and, as the Union is a permanent institution, *ample means* should be provided; by this is meant ample appropriations and capable men.

As the coming conference will be an important one, and a splendid chance is offered to enlighten the foreign members of the Union in regard to the American inventors needs, it behooves every inventor and manufacturer to exert by every means in his power the influence of his representative and senators in Congress in behalf of legislation necessary to get proper representation at the arriving conference of the "International Union for the Protection of Industrial Property."

Every inventor and manufacturer should exert his influence, so that proper measures are taken at *this* session of Congress, for it will be too late to wait until the new Congress assembles.

There is no question that the European countries are gradually getting more liberal in their patent systems. I believe America can do much to advance her liberal ideas with powerful representatives at conferences of this Union. The more liberal European patent system, the better field for the United States inventor and manufacturer.

Yours truly,

AMERICAN INVENTOR.

Boston, Mass., Dec. 22, 1888.

Personal.

Mr. A. Carmichael, of Westerly, R. I., has been a New York visitor the past few days and was a guest of Mr. Jarvis B. Edison at the Electric Club, the evening of Prof. Brackett's entertaining lecture.

Mr. Chas. Dutton is one of those genial and generous gentlemen who forgets not the hard-working editor at Christmas time, and this fact may be taken as an explanation of why the editors of this journal are smoking unusually fine cigars these days.

Major E. M. Hamilton, of the Electric Club, is receiving many compliments over the fine painting exhibition he has secured for the Club. Members accompanied by ladies have been constant visitors at the Club of late enjoying the interesting collection.

Mr. Samuel F. Adams, M. E., C. E., supervising architect of the magnificent new building of the *Pioneer Press*, St. Paul, Minn., is visiting in New York. This building, which is thirteen stories high, is lighted throughout with the Mather incandescent system, contracted for by Mr. J. H. Reed, Chicago, some 2400 lamps being used. Mr. Adams will probably make his home in New York in about four months, having accepted the general management of the Crane Elevator Company, of 40 Wall street.

Manufacturing Notes.

The Allegheny County Light Company and the East End Light Company have been consolidated, and hereafter will be operated under one management and use the Waterhouse arc light and the Westinghouse incandescent lamp.

The Edison Machine Works, of Schenectady, N. Y., have just issued a strikingly bound and finely illustrated description of the works, entitled "A day with Edison at Schnenectady." The presswork and paper are both of the best quality and the description is an exhaustive and interesting one, from the pen of Mr. T. C. Martin.

The following circular announcement has been sent out:

The "C & C." Electric Motor Co.
402 & 404 Greenwich street.
New York, Dec. 15th, 1888.

We beg to inform you that we have this day removed our factory and offices to the above address, where business will in future be transacted.

Respectfully yours,
The "C. & C." Electric Motor Co.

Telephonic News

*** The Postal Telegraph Company, will build a line from Washington to New Orleans, La., and establish offices at principal cities. Joseph W. Kates will be general manager of Southern lines.

*** During the trial of a trademark suit in the law courts in London, a phonograph was introduced to reproduce a letter and other papers. The instrument worked successfully, and Judge Kay, who presided at the trial, was surprised and pleased.

*** Jackson Steam Fire Company, No. 18, has entered suit against the Great Southern Telephone Company and the Louisiana Electric Light Company for $125 damages, caused to the engine of the company coming in contact with a guy wire of the defendants, corner of Seventh street and St. Charles avenue, on July 7, 1888. George Wilson, driver of Jackson Fire Company, No. 18, has entered suit against the Great Southern Telephone Company and the Louisiana Electric Light Company for $10,000 damages, claimed for injuries received by coming in contact with a guy wire supporting defendants' poles, while he was driving the said engine in response to an alarm of fire near the corner of St. Charles and Seventh streets, on July 7, 1888.

*** James A. Derrom, general agent in Venezuela, is home to spend Christmas, but returns on the steamer "Philadelphia" on the 27th inst., taking with him a large shipment of instruments and supplies. He reports that since July 1st, 1888, he has gained 152 paying subscribers to his system in Caracas, La Guayra, Valencia and Porto Cabello, in which cities this company controls the telephone business under a concession granted June 11th, 1888, and still in full force. The central office in Caracas is being enlarged by the addition of a second story, to accommodate the new multiple switchboard being constructed by the Western Electric Company, to accommodate the increased business. The system now embraces the four chief cities, with a total of over 825 paying subscribers, and with trunk lines connecting Caracos with La Guayra, and Valencia with Porto Cabello.

*** Supt. W. W. Smith, of the Missouri & Kansas Telephone Company, has just returned from a trip to Topeka, Kas., to see how the boys were getting in the new multiple board in the exchange there. It will have a capacity for 600 telephones. Mr. Smith reports Topeka as deeply interested in electrical enterprises. He says the electric road being put in by the Radid Transit Company will, when completed, be the longest electric railway in the United States. The steam dummy line of the company was about 14 miles long, and the route of the electric road has been extended until it will exceed 15 miles. The Topeka Street Railway Company is now following suit, and has appealed to the council for the privilege of converting its line into an electric road. Electric light matters are also booming there. The North Topeka Electric Light Company, recently organized, whose plant is not near completion yet, has assurances already of a patronage at the very first turn of a wheel, that will exhaust its total capacity. The city's own electric light plant is in need of an increased capacity. It is now proposed that the State House and grounds be lighted by electricity.

The Company, Mr. Smith informs our correspondent, will have torn down during the year ending December 31, 75 miles of wire, which has been more than replaced by cables. The wire torn down had been in use for from five to six years, and had become so fragile that one break in it could not be repaired without causing a number.

The St. Louis Telephone Opinion.

Below will be found the full text of the opinion referred to in the REVIEW last week:

This was a prosecution against the Bell Telephone Company, of Missouri, for the violation of an ordinance which provides that "the annual charge for the use of the telephone in the city of St. Louis shall not exceed $50."

A violation of the ordinance is made a misdemeanor, and subjects the offender to a fine of not less than $50 nor more than $500. The defendant appealed from a judgment assessing a fine of $300 against it. The defendant is a corporation organized under article 5 of chapter 21 of the Revised Statutes of this State, and hence has all the powers therein conferred upon such corporations. Among others, they have the power to own and operate lines of telephone, to make such reasonable charges for the use of the same as they may establish, to erect their poles along and across public roads and streets, to condemn private property for a right of way, and they are charged with the duty of receiving and transmitting messages with impartiality and good faith. The defendant neither affirms nor denies the power of the State itself to fix a maximum rate of charges, but does contend that no such power has been delegated to the city of St. Louis. The defendant's property, consisting of poles, wires, fixtures and the like, is, of course, private property; but the property is devoted to public use, and since the defendant has conferred upon it special franchises and privileges, including the right of eminent domain, the corporation is subject to public regulations; and we shall take it for granted that the State has the power to fix and prescribe a maximum rate for telephone service. That this power could be delegated to municipal corporations, is equally clear. The ordinances of the city of St. Louis must not be in conflict with the general laws of the State. If the city has had this power to fix rates conferred upon it, then an ordinance which fixes reasonable maximum rates would not be in conflict with the law under and by virtue of which the defendant is organized, and which law constitutes its charter.

A telephone company, when once its poles are planted and wires stretched on or over the streets of a city, becomes in effect a monopoly, and the company must submit to such reasonable regulations as the municipal corporation has power to prescribe. The important question, then, is whether the city of St. Louis has the power to enact the ordinance in question, the power to fix reasonable maximum charges for telephone service, and nothing to the contrary being shown in this case, it is assumed that the rate fixed is reasonable, so that the question is narrowed down to one of power on the part of the city to fix telephone rates at all. If the city has such power it must be found in a reasonable and fair construction of its charter. Judge Dillon makes the full and comprehensive statement of the rule as to municipal powers: "It is a general and undisputed proposition of law that a municipal corporation possesses and can exercise the following powers and no others: (1) Those granted in express words. (2) Those necessarily or fairly implied in or incident to the powers expressly granted. (3) Those essential to the declared objects and purposes of the corporation—not simply convenient but indispensable. Any fair, reasonable doubt concerning the existence of power is resolved by the courts against the corporation, and the power is denied." [1 Dillon Municipal Corporations, 3d ed., sec. 89; see also St. Louis *vs.* McLaughlin, 49 Mo., 562.] The rule, as before stated, is in accord with what we said in the City of St. Louis *vs.* Herthel, 88 Mo., 128. The city places some reliance on its general power to regulate the use of streets. This power extends to new uses as they spring into existence from time to time, as well as to uses common and known at the time of the dedication or grant of the power to the municipal corporation. [Ferrenbach *vs.* Turner, 86 Mo., 416.] The erection and maintenance of telephone poles is one of new uses; such use is a proper use of the streets. Julia Building Association *vs.* Bell Telephone Company, 88 Mo. 258. That the company is subject to reasonable regulations prescribed by the city, as to planting its poles and stringing its wires and the like is obvious. Such regulations have been obeyed by this defendant. Conceding all this we are at a loss to see what this power to regulate the use of the streets has to do with the power to fix telephone charges. The power to regulate the charges for telephone service is neither included in nor incidental to the power to regulate the use of streets, and the ordinance can not be upheld on any such ground. By the fifth subdivision of section 26, article 3 of the Charter of St. Louis, the mayor and assembly have power "to license, tax and regulate lawyers, doctors, etc., etc., telegraph companies as corporations, etc., etc., and all other business, trades, avocations or professions whatever." Telephone companies are not mentioned, though a vast number of trades, professions and avocations are specified. They are not mentioned in all probability because not existing at the date of the charter. In construing this paragraph of the charter we held in the case of City of St. Louis *vs.* Herthel, *supra*, that architects were, for purposes of construction, *ejusdem generis* with lawyers, doctors, dentists and artists, and therefore included by the general concluding words. So in this case it may with equal propriety be said that telephone companies are *ejusdem generis* with telegraph companies, and therefore included in the words of the general concluding clause.

It can make no sort of difference that these telephone companies were not in existence at the date of the charter. One of the objects had in view by the use of the general clause was to provide for just such cases. As aptly observed in that case, "we are to construe it (the charter) according to the intent of the framers, and that intent must be gathered from the language and object of the chartered provisions, and giving that language and interpretation neither strict nor strained." Does then the power to regulate telephone companies, when that term is coupled with the powers to license and tax, give the city the power to regulate the charges for telephone service? By the general statutes of Massachusetts of 1860, page 167, it is provided that the mayor and aldermen of any city may make rules and orders for the regulation of carriages, and may receive $1 annually for each license granted to a person to use a carriage in the city. Under this power it was held, in Commonwealth *vs.* Gage, 114 Mass., 328, that a city might fix the compensation to be charged by hackney coachman. This case would at first seem to furnish some authority for the claim made by the city in this case. Turning to other provisions of the charter, we find that express power is given to establish ferry rates; to fix the rates for the carriage of persons, and of wagonage, drayage, and cartage of property; to regulate the price of gas; and to regulate and control railways within the city as to their fares, hours and frequency of trips. These express powers to fix prices, fares and charges, in these specified cases, are followed by no general words. With this specific enumeration of cases where the city may regulate the compensation to be charged, it impliedly appears that such a power was not intended to be given in other cases. This conclusion presents itself with more force when we see that by the clause before quoted the city has power to license, tax and regulate private carriages, omnibuses, carts, drays and other vehicles; so that the framers of the charter did not regard the power to license, tax and regulate sufficient to give the power to fix rates and charges. The power to regulate, it may be conceded, gives the city the right to make police regulations as to the mode in which the designated employment shall be exercised. [1 Dillon on Municipal Corporations, sec. 358.] But taking these charter provisions together we think it would be going to an extreme length to say they confer upon the city the power to fix telephone rates. If it has power to do this, it may also fix the charges for telephone services, and also for the other designated services which are of a public character. We conclude that the city has no power to pass the ordinances in question by reason of any of the charter powers before considered. This brings in the general welfare clause, which is in these words: "Finally, to pass all such ordinances, not inconsistent with the provisions of this charter or the laws of the State, as may be expedient, in maintaining the peace, good government, health and welfare of the city, its trade, commerce and manufactures, and to enforce the same by fines," etc. Sometimes the power to enact ordinances is given in general terms, and in other cases there is a specific enumeration of the powers. This difference, says Dillon, "is essential to be observed, for the power which the corporation would possess under what may be termed the welfare clause, if it stood alone, may be qualified, or where such intent is manifest, impliedly take away by provisions specifying the particular purposes for which by-laws may be made." [1 Dillon, Municipal Corporations, 3d ed., sec. 315.] Under a general power like the one now in question this court has held that the city may pass ordinances concerning vagrants, prohibiting persons from keeping open their places of business on Sunday, and prohibiting cruelty to dumb animals. [St. Louis *vs.* Schoenbush, 95 Mo., 618, and cases cited.] These matters are all within police regulations, strictly speaking, and naturally fall within the domain of municipal legislation and regulation. To say that under this general power the city may fix rates for telephone services would be going entirely too far. This conclusion is manifest when we consider that the charter points out with particularity those cases in which the city may fix rates and charges. What has been said in respect of the power to license, tax and regulate, applies with equal force here. We are not cited to, nor have we found, any adjudicated case which will support the ordinance now under consideration under the present charter powers of the City of St. Louis. The judgment in this case is therefore reversed. Ray, Judge, absent. The other Judges concur.

F. M. BLACK, Judge.

THE BURIED WIRES OF BROOKLYN.

Annual Report of the Subway Commissioners.

Professor George W. Plympton, president of the Electrical Subway Commission, of Brooklyn, gave out for publication the report of that board for 1888, on Monday of last week. It is addressed to the Mayor, and is mainly as follows:

The aggregate length of conductors underground has been increased from 1,433 to 2,928 miles, that is to say, more than doubled. This figure includes a little over seven miles of cables, attached under temporary permits to the elevated railway structures. The total mileage of aerial conductors in Brooklyn, apart from the wires of the city departments, as reported in June, 1886, when the work of putting conductors underground may be said to have begun, is shown in the following table, which exhibits also the present state of affairs, according to the latest reports from the different companies:

MILES OF CONDUCTORS IN BROOKLYN.

	1886. All Aerial.	1888. Aerial.	1888. Underground.
American District Tel. Co....	168.0	168	
American Rapid Tel. Co.....	8.7	*a*	
Baltimore and Ohio Tel. Co.	137.7	*b*	
Brooklyn District Tel. Co.....	37.0	46	
Brooklyn Electric Time Co...	4.0	*a*	
Citizens' Electric Ill. Co. (Municipal Elec. Light Co.) ..	58.5	80	50 *c*
Eastern Dist. Messenger Co..	6.0	6	
Gold and Stock Tel. Co.....	5.0	29	
Greenpoint District Tel. Co..	8.0	8	
Metropolitan Tel. & Tel. Co..	353.0	353	
N.Y. and N. J. Telephone Co.	3,557.0	4,166	2,871 *d*
People's District Tel. Co.....	9.0	9	
Western Union Tel. Co.	277.3	236	57 *e*
Williamsburgh Dist. Tel. Co.	30.0	*a*	
Postal Telegraph Co.		25	
Totals.....	4,659.2	5,117	2,978

a Reported as having discontinued business.

b Absorbed by the Western Union Telegraph Company.

c Attached to elevated railway structures, as explained elsewhere in this report.

d Including about seven and one-half miles of cable, temporarily attached to elevated railway structures, as explained elsewhere in this report.

e Including a short cable, under the same conditions as *d*.

Of the aggregate of 5,117 miles of aerial conductors now reported, those of the various district telegraph companies and of the Gold and Stock Telegraph Company occupy housetops and not poles; and since there has appeared no method of concentrating their small but scattered mileage in conduits which would not be at once destructive to their business, the board has continued to permit their operation above ground. The wires of the Metropolitan Telegraph and Telephone Company occupy a limited territory, mostly along the water front, reserved by that company when its rights in Brooklyn were transferred to the New York and New Jersey Telephone Company. No extensions have been made since 1886, and it has not been deemed practicable to require the construction of conduits for the small mileage reported above. These conductors aggregate 715 miles, which being subtracted from the total of aerial wires, leaves 4,402 miles of telegraph and telephone wires more immediately the subject of the operations of this board. Of this amount it is reasonable to expect that nearly all of the 236 miles of telegraph wires now carried on poles will be removed. Of the remaining 4,176 miles of telephone wires, a considerable proportion is required for terminal distribution in connection with the subway system; another large part will be removed from poles within the next few months, and much, if not most, of the remainder is so distributed that it is not practicable at present to combine the separate wires in cables.

The last class is, however, constantly changing, by reason of the rapid extension of the telephone business. As will be seen from the above table, the mileage of the New York and New Jersey Telephone Company has increased from 3,557 miles in 1886 to 7,037 miles at this time. This increase has already augmented the number of wires in certain localities to such an extent as to permit the introduction of cables; and many miles of wire are now, in consequence, underground, which were too scattered in 1886

to be practically so disposed of. The continuance of the same process will permit the removal of many of the present poles and wires, but it is to be expected that the growth of the business will still keep in advance until it shall have reached a certain normal relation to population and business, after which its further increase should be merely in proportion to these. What that point is, or when it will be reached, it is impossible at this time to predict, because the applications of electricity, already numerous, are daily multiplying, and the possible field for this form of energy in the transmission of power, the generation of heat, and the performance of chemical work, as well as in lighting and communication, is as yet unmeasured. Confining the question to the telephone business (which now represents everywhere the largest mileage in cities), it is clear that in all our large cities the number of telephone subscribers has grown, and will for some time continue to grow much faster than population. Moreover, a very large proportion of this growth is represented by subscribers residing at considerable distances from the business centers of cities—these being the ones to whom the benefit of such a means of communication is greatest. But such subscribers are necessarily reached at first by single scattered wires, and it is not until they become relatively numerous within reach of a given distributing point that a cable can be laid to that point for supplying them. To the rate, extent and nature thus briefly outlined of the increase in electrical business is due the noteworthy fact stated as follows in the report of the Engineer Commissioner of the District of Columbia, dated December 6th, 1888:

"I believe there is no city in the United States where efforts have been made to place the wires underground where the amount of overhead wiring is not to-day much greater than at the time when those efforts were commenced. No matter how much wire has been placed underground, the increase of overhead lines has always been greater."

The information gathered by this board, through correspondence and personal inspection, concerning the progress of such work in all the principal cities of the country, entirely confirms the belief stated in the above paragraph. In Washington, for instance, where the work was begun earliest and under the most favorable auspices as to the simplicity of the problems involved in it and the adequate authority of the officials charged with its execution, there were in 1883 but 767 miles, and there are at present 2,688.75 miles of aerial wire, although 1,671.86 miles of underground wires have been laid in the meantime. In Chicago, where the work of burying wires commenced in 1884, there are now, according to the city electrician, about 12,000 miles overhead and 5,300 underground; and if the mileage of single wires in 54 miles of cable, owned by the city itself, be deducted, the underground mileage of private companies after five years will be shown to be less than that of Brooklyn after half that time. The elements both of advantage and of difficulty vary so widely in different cities that comparisons based on wire mileage alone are too superficial to be either just or useful. This board does not claim, therefore, special credit for the fact that the actual increase of underground mileage has been considerably greater in Brooklyn during the past year than any other city. A more tangible and directly useful result of such work as is here considered is measured, not by the aggregate length of conductors of various classes, but by the actual removal of poles and wires from important thoroughfares. In this respect the following statement of what has been accomplished in Brooklyn is not discreditable, although, as will be explained, it is less than might have been realized had the co-operation of the city departments been practicable.

WIRES TAKEN DOWN.

1. BY THE NEW YORK AND NEW JERSEY TELEPHONE COMPANY.

Street and avenues.	Miles.
Smith, from Fulton to Atlantic	14
Smith, from company's office to Red Hook lane	8
Atlantic, from Smith to Court	20
Atlantic, from Smith to Boerum place	9
Fulton, from Nostrand to Bedford	24
Fulton, from Marcy to Bedford	50
Fulton, from Marcy to Nostrand	15
Fulton, from Hoyt to Red Hook lane	45
Fulton, from Boerum place to Elm place	15
Fulton, from Greene to Raymond	3
Fulton, from Middagh to Ferry	10
Willoughby, from Jay to Adams	8
Willoughby, from Jay to Raymond	115
Raymond, from Willoughby to Myrtle	
Raymond, from Willoughby to Fulton	3
Raymond, from DeKalb to Fulton	2
Marcy, from Madison to Fulton	8
Marcy, from Madison to Gates	9
Marcy and Gates	10
Navy, from Myrtle to Fulton	4
Court, from Remson to Atlantic	15
Court, from Remson to Montague	2
Myrtle, from Raymond to Grand	50
Myrtle, from Clermont to Hudson	25
Myrtle, from Pearl to Clermont	20
Adams, from Myrtle to Johnson	2
Johnson, from Adams to Washington	2
Eight, between Second and Third Avenues	3
Lynch	60
Nostrand	50
Fractions omitted above	2
Total	614
To be removed before December 31, 1888	100
Total for the year	714

2. BY THE WESTERN UNION TELEGRAPH COMPANY.

Streets and avenues.	Miles.
Myrtle, from Adams to Canton	7
Fulton and Flatbush, from City Hall to Atlantic	13
Total	20

3. BY THE ELECTRIC LIGHT COMPANIES.

Streets and avenues.	Miles.
Broadway, all wires Myrtle, nearly all wires, Fulton, nearly all wires.	50

RECAPITULATION.

	Miles.
Removed by the Telephone Company	714
Removed by the Telegraph Company	20
Removed by the Light Companies	50
Total wires removed in 1888	784

The electric light companies are proceeding to remove all remaining wires on Myrtle and Fulton avenues; and the telegraph company has already drawn into the conduit in Court street a cable 2,100 feet long, extending to Atlantic avenue, and will remove the corresponding wires as soon as the cable shall have been connected and tested. It is, therefore, reasonably certain that by the end of the year the above aggregate of wires removed will have been increased to, say, 800 miles. The amount removed previous to 1888 was a little over 600 miles, making a grand total of overhead wires removed since the organization of this board, of about 1,400 miles. No account is here taken of a few removals of wires by the city departments, since these were simply transferred from one line of poles to another, in order to permit the first line to be taken down, and, therefore, did not diminish the overhead mileage.

Poles were taken down as follows: Removed by the telephone company, 72; removed by other companies, 245; total poles removed in 1888, 317.

The number of poles removed previous to 1888 was 18, making a grand total, since the organization of this board, of 335. It should be here observed that in addition to the 92 poles, carrying telegraph and telephone wires, which have been removed during the present year, 332 were marked for removal, and might have been taken down if the city authorities had been in a situation to co-operate effectively with the board. But as the city wires were not removed, the poles necessarily remained. The board can only regret that the actual result of its labors, in poles taken down since its organization, is thus reduced to less than one-half of what it might have been, and that the removal of 800 miles of wires has effected the removal of only 317 poles. It is to be hoped that the repeated declarations of the board on this point have placed the responsibility where it belongs. In other cities where real progress has been made in the removal of pole lines, the municipal authorities have taken the lead. Brooklyn has been heavily handicapped in this respect, since, notwithstanding the good will and spirit of co-operation exhibited by successive Mayors and heads of departments, no effective action has hitherto been found practicable.

The transition from an overhead to an underground system is a tedious process, particularly with telephone conductors. The number of miles in actual use underground is at all times much less than the number laid and intended to be used. Taking the reports of the New York and New Jersey Telephone Company as an example, we have, in round numbers:

	1887.	1888.	Increase.
Miles of wire underground	1401	2871	1470
Miles of wire in use	900	1565	665
Percentage in use	78.8	54.9	45.2

The explanation of these figures is found partly in the practice of providing, as far as possible, in the laying of cables for prospective increase of business, partly in time required to make and test satisfactorily the numerous individual connections. Thus 100 miles of wire in a mile of cable, laid and tested throughout and ready for service, cannot be brought into actual use until at least 200 separate and electrically perfect connections have been made at the terminals.

These facts are universal. Contrary to the apparent popular impression the construction of a conduit is that part of the effective introduction of an underground system which requires least time and (a suitable design having once been adopted) presents least difficulty.

The actual extension of the system by construction of additional conduits has been small, amounting to but 1.58 miles, giving a present aggregate length of conduit of 15.78 miles, of which about four miles is Dorset concrete, 0.22 miles pipe, and the remainder creosoted wood. The aggregate length of ducts is now 109.78 miles. As may be inferred from the foregoing statements, the principal work of the year has been done in utilizing the conduit already laid and in re-removing overhead lines thus replaced. Much of this might have been done in 1887 but for the action of the board of aldermen, which, as mentioned in the last report of this board, practically paralyzed all operations during the greater part of that year. The ordinance forbidding all openings of streets for subway work occasioned considerable embarassment to the telephone company by reason of the contracts it had made for the materials, etc., to be used in extending subways; but a more serious injury to the work of this board was the prohibition for many months of even the smallest excavations, required to utilize the existing conduits by connecting them with the terminal points of distribution. If the board of aldermen had seen fit to except these trivial excavations, even though it had attempted to stop the construction of main conduits, the season could have been profitably occupied in drawing in, connecting and testing cables, and bringing them into such regular use as to permit the removal of the corresponding aerial wires. This work has necessarily been done during the present year, thus more than doubling, as has been said, the length of underground conductors, although the aggregate length of conduits has been but slightly increased.

Almost immediately after its organization this board recognized the advisability of experimentally attaching electric conductors to the elevated railways, and suggested to the mayor that the permission to make such attachments, if desired, should be made the condition of the franchise of certain lines then about to be built. It was not deemed feasible at that time, however, to insert this requirement, at the risk of defeating agreements already well nigh completed, and nothing of this kind was done. The officers of the elevated railroads were somewhat afraid of the electrical currents, and in one case objection was made on account of the weight of the conductors. Neither of these grounds was considered valid by this board; but, having no power to do more than make the suggestion, it urged the matter upon the electrical companies, and these at last succeeded in effecting private arrangements with the elevated roads by which the desired privilege was obtained. At the last session of the Legislature the board caused to be introduced a bill enabling it to authorize or require, in proper cases, this method of suspending conductors, in lieu of placing them in the subways. This bill passed one House, and failed in the other only through want of time. A similar bill will be introduced at the next session, and, since there is no objection to it in any quarter, its early passage is hoped for. In the absence of such authority the board has granted to the telephone company the temporary permission in streets already provided with subway, to place on the elevated railroad structures the cables which it had been ordered to place in the subways; and these cables (now aggregating between seven and eight miles) are considered and reported as part of the subway system. The electric light companies, being, as the opinion of the corporation counsel, given in 1886, clearly showed, not amenable to this board so long as a subway system has not been perfected for their use, have done voluntarily, at the suggestion of the board, what it could not now compel them to do. Toward both classes of companies the board should be empowered both to require these measures and to control the details of their execution; for it is entirely convinced that, if properly arranged, this disposition is, for electric conductors of all classes, convenient, effective and safe.

As has been already remarked, these companies, at the suggestion of the board, have, during the past year, leased the right to place their wires upon the elevated railroad structures of the city, and, since these structures occupy the principal business streets, such as Fulton street, Myrtle avenue and Broadway, where the larger part of the electric arc lighting is done, the arrangement has proved specially favorable for the rapid removal of poles and aerial conductors of this class. According to the report of the companies given above, there have been removed 225 poles, carrying over 50 miles of wire. This includes all the poles on Broadway, and nearly all those on Fulton street and Myrtle avenue, from which the few poles now remaining will shortly be removed. There are about 80 miles of overhead electric light wires remaining, and more half of these will be transferred to the elevated railroads at an early day. When this shall have been done, four-fifths of the poles and wires of this class will have been removed. But satisfactory as this result may be, and great as is the relief thus afforded to business streets, the problem of electric arc light distribution will not thereby be solved for the future. For the most serious feature of the situation, as all who have undertaken to deal with it have been compelled to admit, is the immense rapidity with which the use of electricity, particularly as transmitted in the form of currents of high tension, is extending. The perfecting of a practicable and safe subway system is still called for, though at the present moment the need of a system is more imperative in other cities than in Brooklyn.

For the lighting of interiors the incandescent system is undoubtedly the most suitable; and the underground system for transmitting its currents of relatively low tension has been successful in practice. This board, as was remarked in its last annual report, approved long ago the plans of the Edison Electric Illuminating Company, of Brooklyn, although it refused to grant to that company any permit which could be construed as an attempt to confer a franchise not yet given by the proper city authorities. The attempt of the company to obtain a mandamus coercing the board to take such action was successfully resisted, and the company, turning at last to the right quarter, obtained the necessary authority from the city. This board looks with satisfaction upon the prospect of the introduction of the incandescent system on a large scale into this city, believing not only that it will prove through its own merits a public benefit, but also that its presence will result in a healthy competition, under the influence of which the arc light companies will be likely to make more earnest endeavors to seek for themselves that solution of the "underground problem" on which the extension of their business must largely depend. That such a solution has been found by Mr. Edison for the conductors of low tension currents used in his system of incandescent lighting is proved by the following (perhaps not complete) list of cities in which that system is now successfully operated through underground conductors:

New York, 55 miles; Philadelphia, 35 miles; Chicago, 20 miles; Detroit, 14 miles; Boston, 12 miles; Columbus, 5 miles; Rochester, 5 miles; Brockton, 3 miles; Fall River, 4 miles; Lawrence, 4 miles; New Bedford, 4 miles. Total mileage, 160.

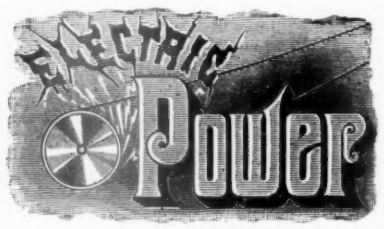
TESTS AND EXPERIMENTS.

Several important investigations are now in progress under the direction of the Board, among which may be mentioned inquiries into the nature, causes and remedy of the following reported facts of experience with electrical conductors:

1. The corrosion of lead covered cables underground.
2. The disruptive discharge in high tension conductors.
3. The deterioration of insulation.

These and other matters, both technical and administrative, connected with the general subject of underground electrical systems in cities will be considered more fully in a report of this board, now in preparation, to be presented when the necessary material, including the results of special investigations of the board shall have been gathered. It may be well to say, however, as to the first subject above mentioned, namely the corrosion of lead covered cables underground that although the examination has not been completed, it has developed nothing so far to change the favorable opinion of this board.

Special thanks are due to Major Raymond, Engineer Commissioner of the District of Columbia; Mr. Walker, chief of the Electrical Bureau of Philadelphia, and Mr. Barrett, city electrician of Chicago, for courtesies shown to the members and agents of this board and the free communication, in advance of official publication, of the results of experiment and current practice under their charge. Some analysis and discussion of these facts will be attempted in the further report of this board, now in preparation, to be presented after the official reports of these gentlemen shall have been published. It is, however, no breach of courtesy to mention at this time the extraordinary progress made in Philadelphia in the extension of conduits during the year, making the present aggregate length of conduits in that city up to 68 miles, and the length of ducts to 496 miles.



The Golden Gate, San Francisco, special train carries storage batteries for furnishing electricity for the lights.

The Ashland Electric Light and Motor Company, of Ashland, Ore., have adapted the Waterhouse system of arc and incandescent lights.

The Lynchburg, Va., Street Railroad Company, will run their cars by electricity and expect to have a system in operation by next spring.

An electric motor, guaranteed to move 100,000 pounds at the rate of 300 feet per minute is to be used on a "transfer table" at the works of the Pennsylvania Railroad at Altoona, Penn.

Messrs. Willis and Hunter, agents of the Eddy motor, have sold and started 11 of these motors in this city during the past 10 days. These enterprising young electricians are making a record.

The Amesbury Cotton Mills are employing a novel method to stop and start the mills. Push buttons with wires to each mill are arranged at the office and all the mills are started by these buttons. This prevents the employes waiting to hear the big bell on the outside of the building.

The Comstock Mines, of Nevada, are adopting electricity for power and an electric company of Cleveland, Ohio, has shipped thither two dynamos and motors of an improved pattern that will run the stamp mill. There are to be six dynamos, one of which will always be held in reserve.

The Julien Electric Traction Company, is to be congratulated over the fact that the city council of New York has finally granted the Fourth avenue street railway company the right to us ethese motors along the entire length of the line. Three Julien cars, using storage batteries, are in daily use on the line and other cars are to be added, the company states, as soon as the car builder can complete them.

Friends of the Westinghouse Electric Company are enthusiastic as to its future, believing that in a year or two at most it will be as great a dividend earner and payer as the Westinghouse Air-Brake. It is certain that its business is growing in volume and profit with remarkable rapidity, and the number of workmen finding employment in its works is steadily increasing.

The first test of the alarm system on the Fifth avenue traction road, Pittsburgh, which is intended to stop the cables in cases of necessity, was made last week. At eight o'clock the bell in the Oakland power house rang, and in an instant every car between Oakland and East Liberty came to a stand. Investigation was made at once, but nothing could be found out of place, and in seven minutes the cable was started again. It is supposed that a telephone or a telegraph wire crossed the alarm wire, and closing the circuit, sent in a false alarm. The promptitude shows the value of the system.

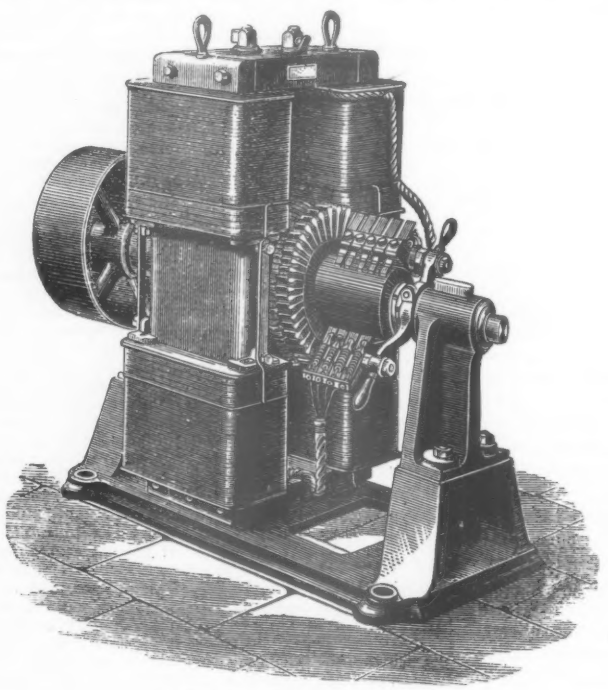
The Pacific Electric Storage Company of 220 Sutter street, San Francisco, has secured a location at Saucelito, and expect to have completed about April 1st a manufactory for storage batteries. The building will be 300 feet long fronting on the bay, and will be one of the best equipped manufactories of the kind in this country. Wm. H. Armstrong is president of the company, Jas. Armstrong, secretary and treasurer, and Frederick Reckenzaun, electrician. This company has the agency for California, Oregon, Nevada, Washington Territory, Idaho and Arizona for the patents of the Electrical Accumulator Company of New York.

The National Electric Light Association.

TRAVELLING RATES TO CHICAGO AND THE METHOD OF OBTAINING REBATE.

In a previous issue we gave notice that through the efforts of Mr. George F. Porter, chairman of the transportation committee, N. E. L. A., one and one-third rates have been obtained for all the delegates travelling to the coming convention in Chicago, in all the territory of the Trunk Line Association, which territory we at that time defined.

It gives us pleasure to now announce that the same active worker has secured the same rates from the Central Traffic Association,



THE SILVERTOWN DYNAMO.

whose territory covers all that portion of the United States lying West of Pittsburgh, Pa., Buffalo, N. Y., and Bellaire, O,, and North of the Ohio River, and East of Chicago, Ill.

The method of obtaining the return ticket from the Chicago Convention (February 19, 20, and 21), is extremely simple, as may be seen from the following letter:

HEADQUARTERS OF
THE NATIONAL ELECTRIC LIGHT ASS'N,
16 East 23 street.

INSTRUCTIONS TO DELEGATES.

NEW YORK, Jan. 1, 1889.

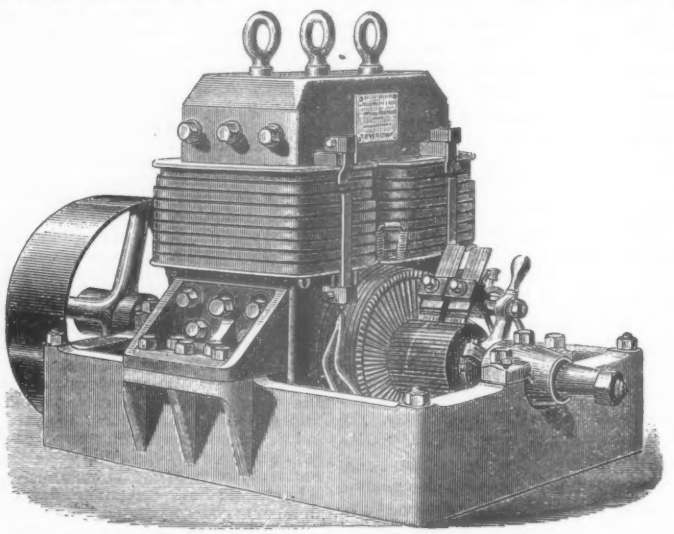
Dear Sir: Through the courtesy of the Central Traffic Association, persons attending the annual convention of the National Electric Light Association, to be held at Chicago, Ill., commencing February 19, *proximo*, will be granted a reduction in their return railroad fare only, under the following circumstances and conditions:

1st. Each person must purchase (not more than three days prior to the date of the meeting, nor later than three days after the commencement of the meeting) a first-class ticket (either unlimited or limited) to the place of meeting, for which he will pay the regular tariff fare, and upon request the ticket agent will issue to him a certificate of such purchase, properly filled up and signed by said ticket agent.

2d. If through tickets cannot be procured at the starting point, the person will purchase to the nearest point where such through tickets can be obtained, and there repurchase through to place of meeting, requesting a certificate properly filled out by the agent at the point where repurchase is made.

3d. Tickets for the return journey will be sold by the ticket agents at the place of meeting at one-third the highest limited fare, only to those holding certificates signed by the ticket agent at point where through ticket to the place of meeting was purchased, and countersigned by the secretary or clerk of the convention, certifying that the holder has been in attendance upon the convention.

4th. It is absolutely necessary that a certificate be procured, as it indicates that full fare has been paid for the going journey, and that the person is therefore entitled to the excursion fare returning. It will also determine the route *via* which the ticket for return journey should be sold, and *without it no reduction will be made*, as the rule of the association is that "No refund of fare will be made on any account whatever, because of failure of the parties to obtain certificates."



THE SILVERTOWN TWO-POLE DYNAMO.

5th. Tickets for return journey will be furnished only on certificate procured not more than *three days* before the meeting assembles, nor later than three days after the commencement of the meeting, and will be available for continuous passage only, no stop-over privileges being allowed on tickets sold at less than full fares. Certificates will not be honored unless presented within *three days* after the date of the adjournment of the convention.

6th. Ticket agents will be instructed that excursion fares will not be available unless the holders of certificates are properly identified, as above described, by the secretary on the certificate, which identification includes the statement that one hundred or more persons, who have purchased full fare tickets for the going passage, and hold properly receipted certificates, have been in attendance at the meeting.

The certificates are not transferable, and the signature affixed at the starting point, compared with the signature to the receipt, will enable the ticket agent to detect any attempted transfer.

N. B.—Please read carefully the above instructions, be particular to have the certificates properly filled and certified by the railroad agent from whom you purchase your going ticket to the place of meeting, as the reduction on return will apply only to the point at which such through ticket was purchased.

Yours truly,
NATIONAL ELECTRIC LIGHT ASS'N.
By ALLAN V. GARRATT, *Sec. and Treas.*

This convention will undoubtedly be the largest and most interesting which has ever been held, and will be accompanied by an exhibition of electric light and power apparatus and supplies, which will be in a large hall devoted entirely to this purpose.

Electric light and power men who are not now members of the association, would do well to join at once, which they can do by addressing the secretary, at the above address.

The "Silvertown" Dynamos.

The works of the India Rubber, Gutta Percha, and Telegraph Works Company, are situated on the banks of the River Thames, at Silvertown, England. They are now making dynamos of both the double and single horseshoe types, in all cases using a modified Gramme armature. In the larger machines, the field-magnets are built up in such a manner that one side of the machine may be removed, and the armature drawn out sideways says the London *Electrical Engineer*, so as to avoid all chance of damaging the coils. The magnet-coils are wound on separate bobbins, slipped on over the iron cores; and the wires on each bobbin are brought to terminal blocks carried on its flanges, the connections between the several bobbins and the terminals of the machine being made by copper strips, which are easily detached should it be necessary to test or remove a bobbin separately.

An example of each type is shown in the accompanying illustrations; the double horseshoe machine being for 27,000 watts at 600 revolutions, and the single horseshoe machine for 20,000 watts at 550 revolutions. This latter type is used chiefly coupled direct to a high-speed engine, in which case the bearing at the pulley end is dispensed with, and the dynamo-shaft rigidly coupled to that of the engine. The copper coils of the armature are wound by hand on the core, which is generally built up of soft charcoal iron wire, and is carried on a gun-metal center which connects it with the driving-shaft. The iron cores are wound up in special lathes, so arranged that five or six wiree are wound on at the same time; the wires passing through a die, carried on a slide rest, worked by a traversing screw, which is set to give the right pitch for the number of wires employed, and thus winds them regularly on the gun-metal center. This latter is fitted on a cast-iron mould so as to make a complete cylindrical surface for the wires to lie up on.

The Cable Cash System in Rhode Island.

TO THE EDITOR OF ELECTRICAL REVIEW:

I would respectfully take exception to statement in your last issue in reference to the cable cash system in operation in Merchants' Exchange, Providence, as being the first of its kind in this State. We have had one in operation in this city at the People's Store for the past eight months, power for same being supplied by a one-half horse-power Sprague motor, and it has been a perfect success. Respectfully yours,

L. C. LINCOLN,
Sec. Woonsocket Electric Machine and Power Company.

Woonsocket, R. I., Dec. 29.

Electric Light Consolidation at Pittsburgh.

The two electric light companies of Pittsburgh have been consolidated, and will hereafter be operated under one management. They are the Allegheny Light Company, which operates 20,000 incandescent lights in Pittsburgh proper, the Southside and Allegheny, also 250 Brush arc lights, and the East End Light Company, which has 4,000 incandescent lights in the East End. A controlling interest in these companies is held by Westinghouse, who also operates the Westinghouse Electric Works. All the material needed by the two light companies is furnished by this concern.

When the East End company secured the contract for lighting the city of Pittsburgh with 330 arc lights and 3,000 incandescent lights, the Allegheny Light Company made an effort and succeeded in being released from the contract to use the Brush arc light, when it was decided to consolidate the two companies. Both charters will be retained, however, but the companies will be operated under one management. The Waterhouse arc light will be used, and the machinery, etc., will be placed in the Westinghouse Electric Works.

The capital stock of the Allegheny Light Company is $500,000, and the East End Company is $100,000, but will soon be increased to $300,000.

Mr. Robert D. McGonnigle, secretary of the Allegheny Light Company, was seen, and corroborated the above. He said: "The Westinghouse Electric Company has purchased the Waterhouse arc light system, and will manufacture in connection with its incandescent system. Now that we are free from our entanglements with the Brush system, we are enabled to pool our issues, and have consolidated with the East End company. We will now have to build a new station at a cost of about $100,000, but nothing definite has yet been done. I do not know where it will be placed, but you can say with safety that it will be put where it will do the most good. The Consolidated Light Company will be the largest concern of the kind in the world, that is in the number of lights furnished."

The Electrical Testing Bureau of the Johns Hopkins University.

A few weeks ago as announced in these columns the Johns Hopkins University formally opened a Department of Electrical Standards. This was done not only with a view of establishing in this country an institution of the same scientific value as the Department of Standards of the British Association, but also to offer a means whereby electrical apparatus of new design might be carefully tested, and subjected to such experiment as would indicate its practical worth.

The value of such a Bureau—outside of whatever educational interest may be attached to it—to manufacturers of electrical supplies, to engineers, and to those engaged in the various branches of applied electricity, is not easily overestimated even now; and when, after a few years, accurate measurements of electrical quantities shall have become a necessity, instead of being merely tolerated, its influence cannot but be felt in the highest degree.

A description of the methods employed in the testing of such instruments and apparatus as are of everyday use, has been given elsewhere, in connection with an outlined sketch of the facilities offered by the Physical Laboratory, and of the various standards now in the possession of the University.

Several of these methods, though subjected for many months to careful scrutiny both by teachers and students in the Laboratory, are new to the general public, and the manner of determining the efficiency of small dynamos and motors was published for the first time in a circular issued by the Bureau in the beginning of the term. In this method, as then stated, the motor or dynamo as the case may be, is placed inside a water jacket which completely surrounds it. The jacket itself is first carefully covered by a thick layer of felt, about two or three inches thick, and the whole placed inside a wooden box just large enough to hold it. In this way the losses from radiation are very much reduced.

The motor having been placed in the apparatus, a stream of water of constant temperature is allowed to circulate through the jacket and the flow determined by weighing the quantity which passes in a given time. Then the radiation is determined by noting the difference in temperature between the water as it flows in and as it flows out, and a correction is afterwards applied for this. Finally the motor is started, the current and electro-motive force determined, and then from the heating of the water in the jacket—which represents *all* the losses occurring in the motor, *mechanical* and electrical—the efficiency can be at once calculated.

A series of tests of motors of ½ horse-power has already been made according to the method, and the results have been extremely satisfactory. The values found in in this way agree remarkably well among themselves and the probable error is very much less than that of any other method at present known.

The mark of standardizing ammeters, volt-meters, etc., has steadily gone on and resistances in the form of variously modified cases have been compared with standard and their temperature coefficients determined within desired limits.

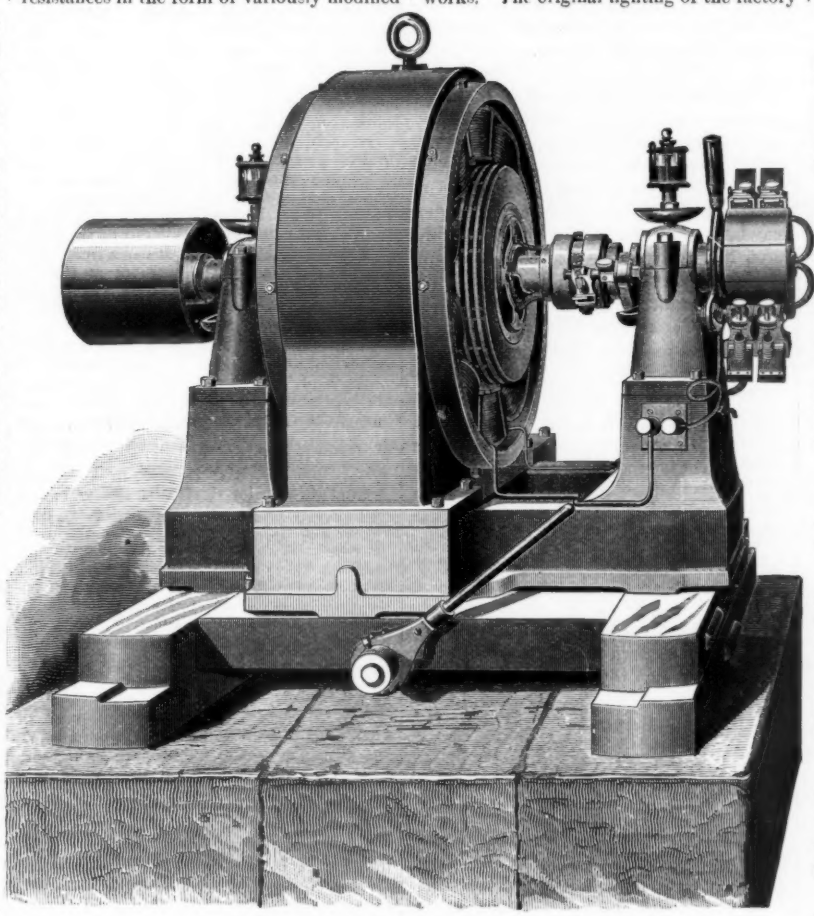
A great deal of attention has been given to the measurement of the insulation resistance of wires and cables and several elaborate experiments have already been made in this direction. It is proposed to employ a form of condenser designed by Prof. Rowland as a standard instrument, for such work in the near future, and the results of some experiments now under way will soon be published.

The storage battery has not been neglected and a series of determination of the capacity, discharged rate, and efficiency of a number of different types of cells, has been made during the last two months. The question of the variation of capacity with different discharge rates is a very important one, and such measurements as are necessary to determine this, as well as the life of the battery, should always be made.

Altogether the work of the Electrical Testing Bureau has been steadily on the increase, and apparatus has been sent for experiment much more rapidly than was anticipated. This is perhaps the best proof of the desirability of such a laboratory and shows that we are just as anxious for accurate work as our brethren across the Atlantic.

Thomson-Houston Dynamo.

We present herewith an illustration of the Thomson-Houston alternating current dynamo, self-exciting, for long distance incandescent lighting. This type of machine though apparently similar to others before placed on the market, differs from them in many essential features and embodies many important improvements. The brilliant records, in freedom from the burning out and consequent destruction of armatures, attained by this machine, is no doubt due to the perfect ventilation afforded by a peculiar construction of the armature head. The commutator at the end of the shaft generates direct currents which are utilized for magnetizing the field magnets. In addition to this type, the Thomson-Houston Company also manufacture an alternating current dynamo to be used with a separate exciter.



THOMSON-HOUSTON ALTERNATING DYNAMO.

Electric Light vs. Gas in France.

Messrs. Brun & Co., owners of a silk manufactory at St. Clamond, gives some particulars in *Annales Telegraphiques* as to the comparative cost of gas and electric lights, obtained from two years' experience in their works. The original lighting of the factory was by 540 gas jets, consuming 2000 francs' worth of gas annually. These were replaced by 600 incandescent lamps - one-half Edison, the rest Swan—the average life being 1200 hours. The current is supplied by an Edison dynamo of 450 amperes and 100 volts. It has worked for eighteen months at an average of fifteen hours per day. Part of the factory works night and day, and some of the lamps work 3600 hours a year, while others are only used for 600 hours. The saving is 38 per cent.

—— The City of Stoughton, Wis., is ready to consider propositions for establishing an electric light system. For particulars address B. E. Wait, city clerk.

—— Citizens in Utica, N. Y., are more or less indignant over the published reports that the light company there are not doing satisfactory work. A letter from a prominent citizen states that the Utica Electric Light Company is running 400 arc and 1,200 incandescent lights. The Fort Wayne Jenney system is used, and the lights are perfectly satisfactory. The street lighting is done by mast arms and towers, and the city is better lighted than any other in the State of New York.

ELECTRIC LIGHT NEWS

—— Marceline, Mo., will have an electric light plant soon.

—— Kansas City, Mo., is one of the best lighted cities in the West.

—— The Badger Illuminating Company is spreading out in Milwaukee.

—— The Summerville, S. C., Street Railway Company, are considering making it an electric road.

—— An electric light company is about being formed at Lamposas, Tex., with an incandescent system.

—— The village trustees of Nelsonville, O., are looking for plans for lighting that town with electricity.

—— The large shoe manufactory of Dingley, Foss and Company, at Auburn, Me., will be lighted by electricity.

—— The Mather Electric Company, is putting in an arc light plant at the New England Mill, in Rockville, Conn.

—— The United States Electric Lighting Co. has obtained the contract for lighting the New York *Times* building.

—— The Knoxville, Tenn., Electric Light and Power Company, have purchased $10,000 of additional machinery for their plant.

—— Applications for electric light are constantly being made to the city council of Augusta, Me., and new lights are being put up daily.

—— The Oakland, Cal., Gas, Light and Heat Co., will shortly introduce the Westinghouse incandescent system for public and private lighting.

—— The Chico, Cal., Electric Light Works destroyed by fire last week were owned by the Electric Light and Motor Manufacturing Company, of Chico.

—— The lighting committee of Gloucester, N. J., is considering the proposition of the electric light company, and will report at the next meeting of the board.

—— The Thomson-Houston Company of Philadelphia has closed a contract for 1,500 incandescent lights with the Camden Electric Light Company, of Camden, N. J.

—— A largely attended special town meeting at Amherst, Mass., this week, voted permission to the Thomson-Houston Company to establish an electric light station in this town.

—— The officials of the city of Council Bluffs, Ia., are considering the question of electric lighting. They propose to do away with the present gas plant, and substitute electricity.

—— A contract has been made with the St. Croix Gas Light Co. to light Calais Me., with electricity for 20 months, at the rate of $72 per light. About 20 lights will be required.

—— The plans of the Edison Light Company buildings, Minneapolis, first called for a building worth $50,000; but these have been changed so that the building will cost as much more as the first estimate, and last week a second permit for $50,000 was issued, making a total estimate of $100,000 for the structure. The work on the building is going right along, and will continue through the winter.

—— The Inter-State Company, Kansas City, has its entire plant in operation. About 500 incandescent lights are supplied directly from the central station. One hundred and twenty cells are on the circuit, which is supplied by a Fort Wayne Jenney dynamo. The sub-stations are supplied by the new dynamo of 50,000 watts capacity, made specially for this plant by the Detroit Electrical Works.

Foreign Electrical Notes—Great Electric Lighting Works.

The central station in the Markgrafenstrasse, Berlin, is now being enlarged by the addition of four dynamos, each having an output of 100 kilo-watts. These machines have been made by Messrs. Siemens on their new plan, with internal field magnets, the armatures being of very large diameter, and direct coupled to the steam engine. The engines for these dynamos have been supplied by Messrs. Kerchove, of Ghent. The engines are of the vertical compound tandem type, and have no fly-wheel except the armature. To save room, the crank shaft has been placed low down, and a pit has been provided in the foundation, within which the armature revolves. Owing to the large size of these machines, it was not considered advisable to finish them completely in the factory, and the armatures have been wound *in situ*. Similar machines are already at work at the railway station at Frankfort-on-the-Main. In addition to the two new central stations projected for Berlin, and on which I have already reported, there will be erected a third station, bringing up the total capacity of electric lighting plant to 18,000 horse-power, capable of supplying 200,000 lamps, which is about one quarter of the total number of gas burners fixed in Berlin. The present capacity of the two existing stations is 3,800 horse-power. In the future it is proposed to use for central station lighting steam engines of 1,000 horse-power, instead of the present unit of 300 horse-power, in order to reduce the proportional cost of attendance. All the manufacturers of glow lamps are busy, and are hardly able to fill the orders they have received for the present season. In many cases works are being enlarged, and the company making the Seel lamp are not only extending their manufactory to three times its present size, but are also projecting the erection of branch factories in Germany and abroad. A demand has lately arisen for lamps of high voltage, and several manufacturers have already made experimental lamps for 150 and 200 volts, some of which I have tested. In no case was the lamp found good enough for practical use. The general defect of all these lamps is that the thin filament is either broken from purely mechanical causes, or when heated by the current, bends and touches the glass, with the result of causing the latter to crack.

The Continental Edison Company are now establishing a small central station in the gardens of the Palais Royal, Paris, from whence current will be supplied to the Theâtre Français, and to the large shops immediately surrounding the gardens. The capacity of the station will be about 1,500 lamps. Several of the shop-keepers in some of the neighboring streets have also applied to the company for current; but as they could only be reached by underground conduits, special permission from the municipal authorities is required, and this question was brought before the council at their last meeting, but without effect. At the same meeting it transpired that none of the tenders sent in by electric light firms for the installation at the "Halles" was in complete conformity with the regulations laid down by the commission. No tender has consequently been accepted, and there are not wanting critics who affirm that the delay in getting to work is simply due to the fact that many of these regulations, as contained in the *cahier des charges*, are impracticable, and must be modified before contractors can accept them. This means more commissions and reports, and if things go on at the present rate, there is no chance of the Halles installation being ready by the time the Exhibition opens.

A central station is proposed for the Beatrix-Gasse, Vienna, for the supply of 10,000 glow lamps throughout a fairly extended district of Vienna. For the present, only plant for 1,000 lamps will be installed. At the station there is about 100 horse power available in water power, and steam engines will be employed for the remainder. The distribution will be by alternating currents and transformers. The baths at Vöslau are also to receive a central station, but details have not yet been worked out. Messrs. Ganz & Co. have received an order to fit up the electric light for the two new turret ships of the Austrian navy, which were launched last year. Current will be supplied by direct acting steam dynamos, and there will be fitted in each ship 300 glow lamps of 8 and 16 candle power. There will also be two search lights of 40,000 candles and one of 80,000 candles, the latter to be supplied by the joint current from two dynamos coupled in parallel. The range of this search light is to be three miles. In connection with their central station in Neu Magarethen, Messrs. Ganz & Co. have applied to the town authorities for leave to take up streets for laying their cables, and the second section of the town council charged with investigating the matter have recommended that leave be given, on the same conditions as have been imposed upon the firms of Siemens and Halske and Engländer & Leistler, in connection with their respective undertakings. Under the title "Wiener Elektricitäts Gesellschaft," a company has been formed, with a capital of one million florins, for the purpose of lightning the fifth, sixth and seventh districts from a central station in Mariahilf. No plans have yet been elaborated, but it is probable that continuous current dynamos will be used.

An installation is proposed for the Central Hotel, Brussels, to consist of 12 to 15 arc lamps at 10 amperes, and of 250 to 300 sixteen candle power glow lamps. The proprietor of the hotel, M. Cordemanns, has invited tenders from several electrical firms for this work. Either steam engines or gas engines may be used for the motive power; but the latter will probably be adopted, on account of no special commission being required, and on account of greater convenience in working. The arc lights will be placed in the court, the entrance hall, and outside of the building. The café will be lighted with 75 to 90 glow lamps. Electrical engineers in Belgium have plenty of work to do. The Railway Minister is inclined to adopt the electric light instead of gas in all the principal railway stations, and tenders will probably shortly be invited for this work. The lighting of the Northern station in the city is now finished, and it has been decided to install the electric light in the new station at Antwerp. In Ghent, industrial establishments are rapidly adopting the electric light, and orders have been placed with M. Dulait, of Charleroi, the Belgian Thomson-Houston Company, and others. Several firms occupying premises in the center of this town, and who desire to adopt the electric light, are requesting the Town Council to take steps in order to insure a supply of electricity. They point out that the municipality might itself become the purveyor of electricity, distributed from the central station at Laeken, or grant licenses to private contractors.

The Cat and the Burglar Alarm.

A few nights ago a certain citizen, after retiring to bed, heard a cat making a pitiful noise in the house adjoining. His neighbor had been away from home for several days, the house being shut up in the meantime. Concluding that the unfortunate feline had been unwittingly locked in, the gentleman resolved to rescue it. From a window in his own house it was easy to clamber through one of his neighbor's, but in so doing he set off an electric burglar alarm. Unconscious of this, however, he started to hunt for the cat. In a few minutes he was surprised to see a couple of police officers walk in, and he found that no excuses he could offer would convince them that he was not a burglar. "I live next door," he said, "and I got in here to look for a cat that has been locked in the house." "You'll come with us all the same," replied one of the guardians of the peace, and with one on each side he was marched to the station-house and locked up, while the charge of burglary was entered against him. Happily he happened to know the lieutenant, and when that official came in the matter was soon set to rights and the gentleman discharged.

OUR KANSAS CITY LETTER.

(Special Correspondence.)

Mr. William Clark, of the Thomson-Houston company's railway construction department, passed through here last week on his way home from a trip West with a number of Eastern capitalists. While in Kearney, Neb., Mr. Clark assisted in the organization of an electric railway company and became interested to the extent of one-eighth of the stock. It will be a Thomson-Houston road. Mr. Clarks says he thinks, after a due investigation, that the Thomson-Houston system is excelled only by the solar system as a motive system.

Sedalia, Mo., is seeking information regarding an electric light plant. If one can be established there cheap enough the city would like to have it. Chillicothe, Mo., has had a Sperry plant in operation for some time, but the company has added Western Electric machines to its establishment. The company has lately secured the contract for lighting the city. At Kirksville, Mo., a Ball electric light plant will begin operations about January 1. The plant will have a capacity for 75 arc lights, and it is the present intention of the company to add an incandescent plant by spring. The company has a first-class equipment throughout, and is being conducted on a liberal and progressive plan. H. J. Patterson is the manager.

Mr. C. H. Cone, the energetic representative of the Electrical Supply Company, will soon open a big warehouse here for all kinds of electrical supplies, and large quantities of goods are being received by him daily. Mr. Cone makes frequent trips to Ottumwa, Ia., but doesn't seem to be doing much business there—that is, in the electrical line—but I suppose that is all right. He managed to notice one thing in the electrical line however, on his last trip there about 10 days ago, and that was the great improvement in the telephone exchange. The Ottumwa exchange has always been a sort of black sheep in the Central Union Telephone Company's family, but it has now come out of the kinks in a wonderful manner. It has a fine building of its own, new equipment at the exchange, and a pole line, that Mr. Cone, with his great admiration of finely strung wire, pronounces perfectly lovely. It runs through the alleys, and the wires are strung on straight clean poles, 50 feet in height.

Mr. E. J. Lawless, formerly superintendent of the Metropolitan street railway company in this city, has been investigating for some time past, electricity as a motive power for street railways. In the course of his investigations he visited and minutely inspected all the electrical railways in operation in the East. He returned fully convinced that electricity was the motive power for street railways, organized a company of capitalists of this city and Springfield, Mo., and has now obtained a franchise for an electric railway at the latter city.

The Carthage, Mo., Electric Light and Power Company has been organized, with a capital stock of $30,000. Charles J., and W. B. Myers, and T. J. Rittenhouse are the incorporators.

The Union Electric Railway Company, of St. Joseph, Mo., has been reorganized as an electric railway and an electric light company, and will establish a large electric light plant. The Wyatt Park electric railway, of the same city, has begun the operation of its line in part, and expects to have cars running over the entire system within a short time. This makes four electric railways in St. Joseph, the other two being the Citizens' and the Frederick street line. The sale of the latter two to an eastern syndicate is now pending, and a representation of the St. Joseph companies is now in the East conducting the negotiations.

The telephone company presented its bill at last week's meeting of the common council of Kansas City, Kas., for $95 for telephones in use by the city, and exploded a dynamite bomb. One of the councilmen said that he understood that the city was to have the telephones free for allowing the company to erect poles in the street. Other councilmen were similarly shocked by the presentation of this bill, and, in order to get even, the city attorney was ordered to prepare an ordinance taxing the poles of all telephone and telegraph companies operating in the city.

The electric light plant at Marion, Kas., is reported to have become lost in the shuffle.

The electric light company of Independence, Mo., will put 12 lights in Eden Park, a high toned residence part of this Kansas City suburb, and three along the road leading thereto. Although this company has not been long established and its path has been somewhat thorny, it is now beginning to bask in prosperity, and reports a steady growth in business and profits.

KAWSMOUTH.

Kansas City, Mo., December 27.

The Puget Sound Telegraph Company has imported a cable from Germany, and last week paid $1,000 duty on it. It will be laid between Seattle and Port Blakely.

OUR WASHINGTON LETTER.

(Special Correspondence.)

Gen. Hunt, formerly governor of Colorado, now engaged in extensive business enterprises in Texas, has just completed a long and careful personal investigation of all the electric street railway systems in operation in the United States. He has gained an unusually clear and practical comprehension of the advantages and disadvantages of each. He expects to build his first road at Laredo, to connect the two cities on the opposite sides of the Rio Grande, and others in various places in Texas. He has organized, and has in operation, several electric lighting companies in that State.

The House Committee on Public Buildings, after advertising for proposals for lighting the building, found it necessary to require bidders to make a deposit of $15 before they could be furnished with copies of the plans and specifications, the money to be refunded when the plans are returned. This will somewhat delay the distribution of plans, and curtail the limited time originally allowed for the preparation of estimates, and unless bidders have anticipated this part of the business, it will not be surprising if some of them ask a postponement of the time fixed for opening bids. Perhaps the wide-awake Westinghouse Company may have something to say to Congress about being ruled out by the Committees low tension specifications.

General Barney was down here the other day to look after the interests of that company in the Senate end of the building, and his visit was followed by a communication from vice-president Byllesby, in reply to the letter of Mr. Johnson of the Edison Company, to Senator Edmunds, which was published in the December number of the *Electrical Engineer*. The correspondence on this subject is in the hands of Senator Aldrich, who will have an opportunity to investigate the continuous-alternating-danger question. The important question involved in the discussions over this Senate lighting plant, is not so much the relative merits or dangers of the two systems as it is of the suitability of construction of the apparatus now in use. The machinery in the dynamo room is a beautiful and substantial piece of work, the superiority of which renders more apparent the marked contrast between it and other parts of the plant. This work was done by some sub-contractor.

A new life-size marble statue of Franklin has just been erected at the corner of Pennsylvania avenue and 10th street. Benjamin stands on a granite pedestal looking down towards the Smithsonian, apparently trying to get a glimpse of Professor Henry, in bronze, through an inextricable tangle of telegraph, telephone and electric light wires. Within a distance of four squares there are 17 poles, no two of them alike, and every one of them a clear exemplification of the Irishman's idea that the purpose of the wires is to keep the poles from falling down.

Edward Rosewater, proprietor of the Omaha *Bee*, is in the city. Ed. was the small-boy of the Military Telegraph Corps to whom Secretary Stanton entrusted the daily countersign of the Army of the Potomac, for a week in advance, when there was danger of interruption of telegraphic communication between the War Department and the army commander.

Emile Berliner has been asked by the Bell Telephone Company to take charge of its exhibits at the Paris Exposition, but has been obliged to decline the offer on account of his gramophone business.

George Kennan, the Siberian traveller, who was one of the earliest telegraph operators, and Miss Cooke, the operator in the patent office, are two of the swiftest and most graceful bicycle riders in the city.

G. C. M.

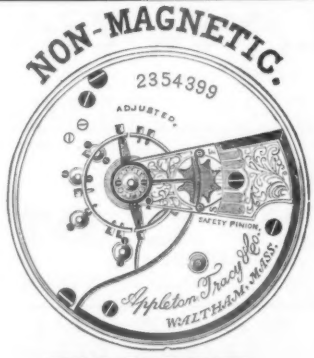
Washington, D. C., Dec. 29, 1888.

At the annual meeting of the Eastern Telegraph Company, held in Portland, Me., the following board of directors was re-elected: Chas. A. Tinker, A. S. Brown, Thos. Roche, Frederick Robie, C. C. Bedlow, C. D. Livermore, J. W. Plaisted.

ELECTRICAL PATENTS

INDEX OF INVENTIONS FOR WHICH LETTERS PATENT OF THE UNITED STATES WERE GRANTED IN THE WEEK ENDING DECEMBER 18, 1888.

391,892 Portable electric welding apparatus; Elihu Thomson, Lynn, Mass.
394,905 Armature core for dynamo electric machinery; Warren S. Belding, Chicago, Ill.
394,914 Telephone exchange system; George F. Durant, St. Louis, Mo., and Henry L. Bailey, Brooklyn, N. Y.; Cornelia A. Bailey, administratrix of Henry L. Bailey, deceased.
394,925 Electric push button; Andrew J. Hoyt, Philadelphia, Pa., assignor of one-half to Franklin Hoyt, same place.
394,946 Electric circuit; John B. Wood, Montreal, Quebec, Canada.
394,950 Machine for cutting wire into sections; William E. Badger, Quincy, Mass.
394,951 Telephone apparatus; Upton H. Balsey, Philadelphia, Pa.
394,952 Overloading and slack cable-stop for electrical hoisting machines; William Baxter, Jr., Baltimore Co., Md.
394,958 Battery cell for electric belts; Simeon Colling, Oakland, Cal.
394,960 Electric telegraphy; Mark W. Dewey, Syracuse, N. Y., assignor of two-thirds to Emil Laass and Charles H. Duell, same place.
394,961 Telegraphic printing code; Mark W. Dewey, Syracuse, N. Y., assignor of two-thirds to Emil Laass and Charles H. Duell, same place.
394,964 Electric switchboard; Isaiah H. Farnham, Malden, assignor to the New England Telephone and Telegraph Company, Boston, Mass.
394,978 Core for the armature of dynamos; David J. Hauss, Cincinnati, Ohio.
394,999 Brush for dynamos; Edwin W. Rice, Jr., Lynn, Mass.
395,018 Electric meter; Elihu Thomson, Lynn, Mass.
395,019 Dynamo electric machinery; Friederich von Hefner-Altenbeck and Carl Hoffman, Berlin, Germany, assignors to Siemens & Halske, same place.
395,028 Flexible sealed cell for secondary batteries; Mark Bailey and John Warner, London, England.
395,083 Process of manufacturing insulated conductors; Werner Siemens, Berlin, Germany, assignor to Siemens & Halske, same place,
395,101 395,102 Signal transmitter; John C. Wilson, Boston, Mass., assignor to the Municipal Signal Company, Portsmouth, N. H.
395,111 Fire alarm annunciator; William A. Barnes, Bridgeport, Ct.
395,112 Electrical alarm; William A. Barnes, Bridgeport, Ct.
395,116 Rheostat; Sigmund Bergmann, New York.
395,123 Circuit-controller for dynamo electric machines; Thomas A. Edison, Menlo Park, N. J., assignor to the Edison Electric Light Company, New York.
395,137 Hotel telephone system; Hammond V. Hayes, Cambridge, Mass.
395,146 Wire stretcher; Charles E. Hunt, Nathan B. Helmand, Henry L. Ferris, Harvard, Ill.
395,157 Dynamo electric machine; Frank F. Loomis, Akron, Ohio.
395,207 Electric cable support; Charles H. Bowen, Washington, D. C.
395,215 Toll apparatus for producing electric light; Dixon H. Davies, Leeds, County of York, and John M. Tourtel, Westminster, County of Middlesex, England.
395,251 Annunciator; Albert Rosenberg, Baltimore, Md.



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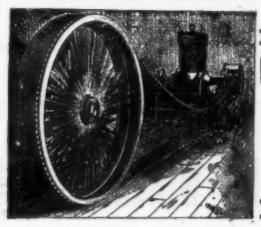

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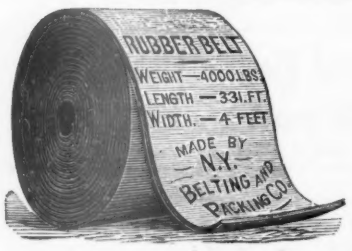

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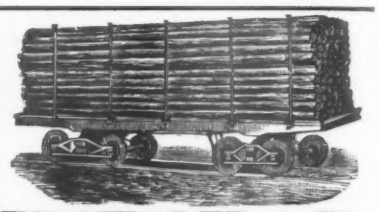

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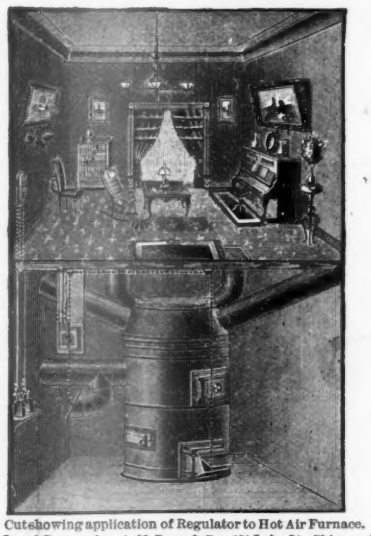

Cut showing application of Regulator to Hot Air Furnace.

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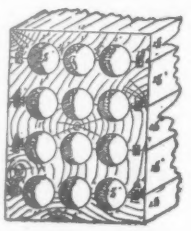

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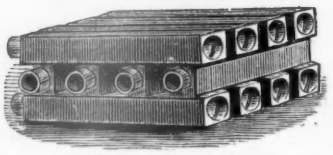

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